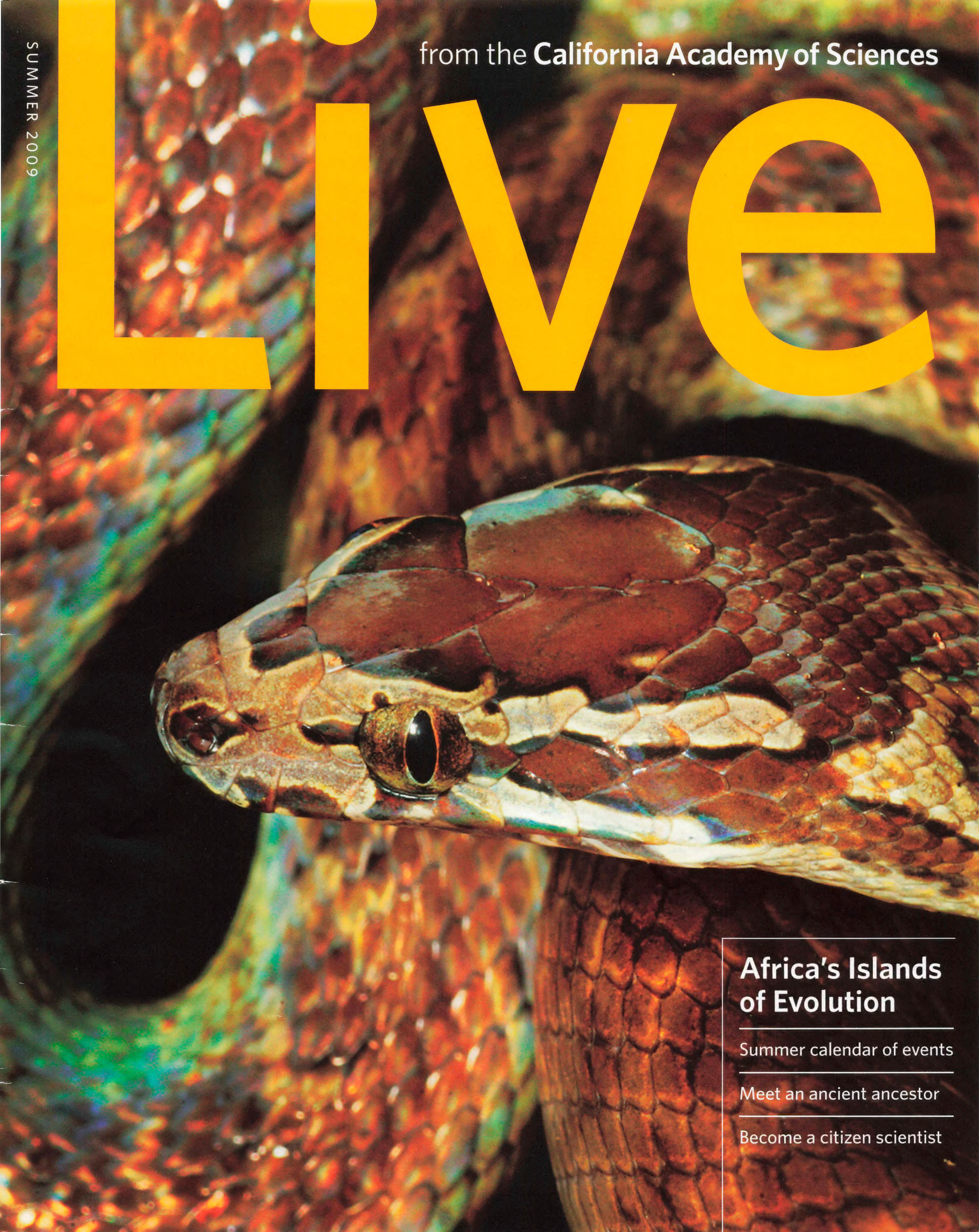
SUMMER 2009

# Live

from the **California Academy of Sciences**



## Africa's Islands of Evolution

Summer calendar of events

Meet an ancient ancestor

Become a citizen scientist

CALIFORNIA
ACADEMY OF
SCIENCES

California Academy of Sciences
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As the school year draws to a close, and thousands of Bay Area school kids celebrate the approach of summer freedom (more time to visit with their favorite albino alligator!), I'd like to share some truly wonderful statistics about the Academy's impact on local schools this year. Since January, when we first launched our school group program, nearly 50,000 students and teachers have visited the new Academy. More than 6,000 of these special guests participated in the Academy's new Arthur and Toni Rembe Rock program for enhanced museum visits. Not only did these 4th and 5th graders receive free admission to the museum, they also were provided with transportation, lunch, special programming, and a free t-shirt that will allow them to return to the Academy as often as they like through the end of the summer. Based on the many thank you notes we've received from our field-trippers, I think it's safe to assume there are more than a few future scientists in their ranks. This is the type of transformative experience that your membership helps to support.

We have an exciting lineup of events to keep both kids and kids-at-heart occupied over the summer. Flip to pages 14-15 to learn more about upcoming lectures and events, including our special celebration of the first annual World Oceans Day in June. As always, we hope to see you here often.

Greg Farrington
Executive Director

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THE ARCHIPELAGO OF
INDONESIA
October 18 - 31, 2009

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**On the Cover**

This house snake (*Lamprophis lineatus*) was photographed in 2006 on the African island of São Tomé. Located in the Gulf of Guinea, São Tomé and neighboring island Príncipe were the destination for four Academy expeditions over the past nine years, and they have yielded numerous insights into island biology and evolution. Read more about these expeditions on page 8. Cover photo by Dong Lin.

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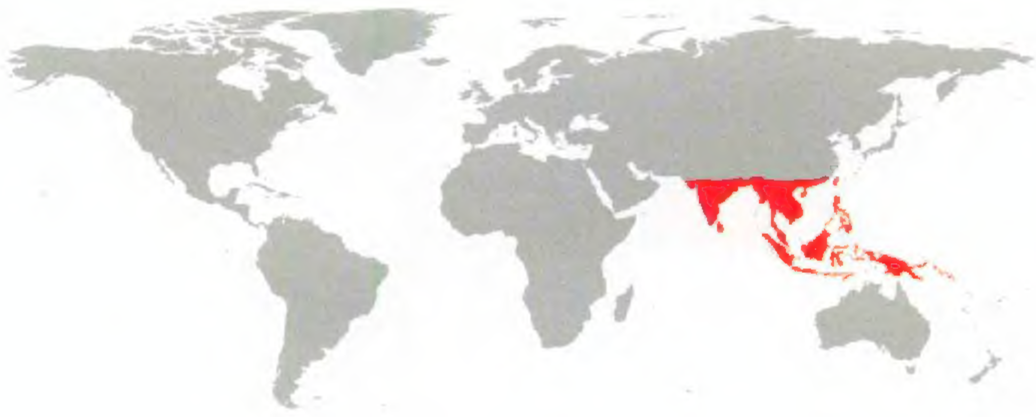
**On the Back**

The free-flying birds in the Academy's Rainforests of the World exhibit are making themselves right at home.



### Where in the World

The Atlas moth lives in Asia, from India to the Philippines and south to Indonesia. The family to which it belongs—the Saturniidae, or giant silkworm moths—has a worldwide distribution.

### Academy Collection

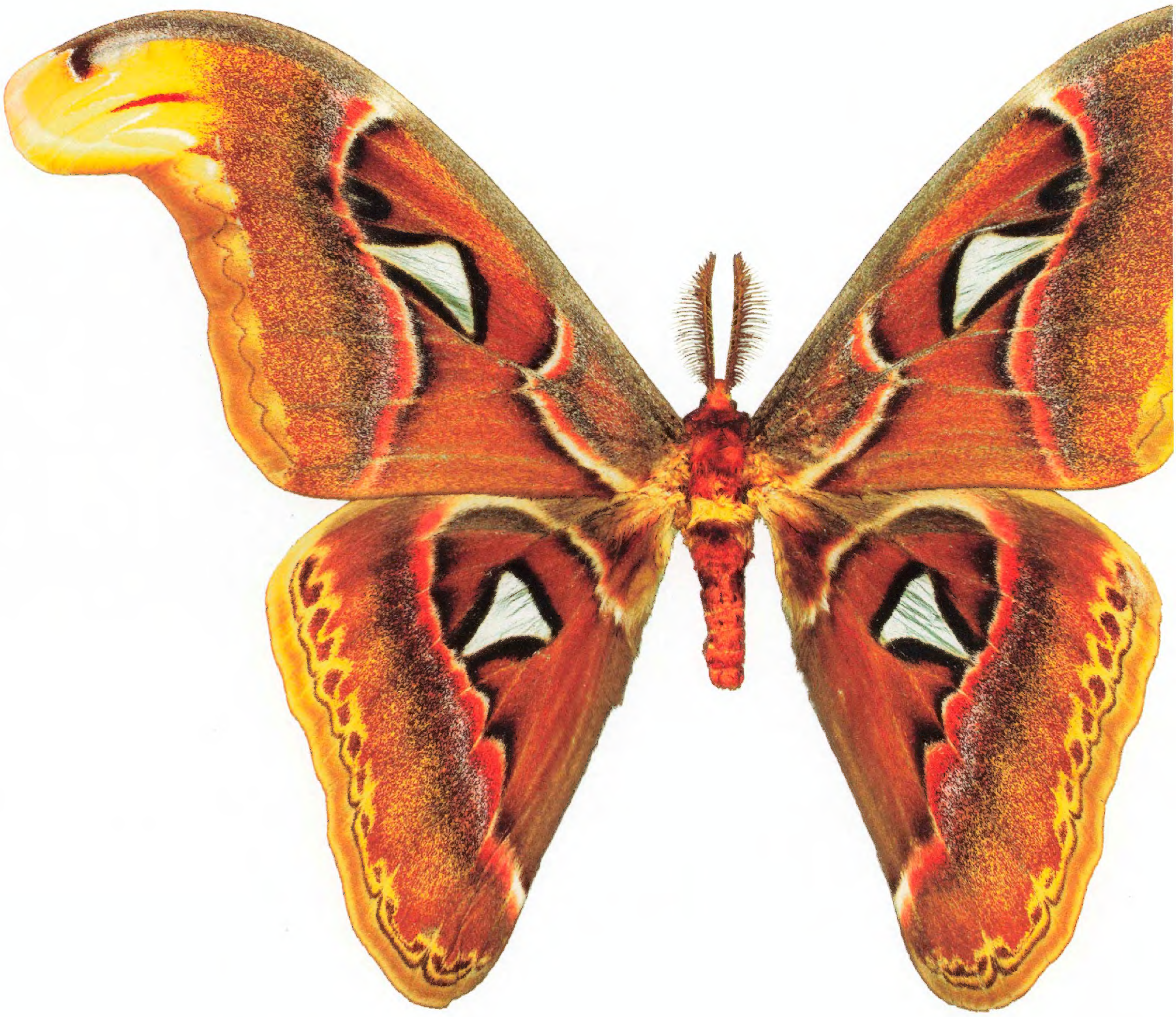
The Academy has 38 Atlas moths in its entomology collection. The specimen pictured here was collected in Taiwan with no date recorded. The Academy has more than 700,000 butterflies and moths in its collection.

### Flying Giants

The Atlas moth is one of the largest moths in the world in terms of wing surface area and wingspan. Its maximum wingspan is about 10 inches. The white witch moth *(Thysania agrippina)* of Central and South America holds the record for largest wingspan at about 14 inches.

### Scaly Wings

If you were to look at this moth's wings under a microscope, you would see thousands of tiny overlapping scales. These scales are pigmented and collectively create the different colors and patterns on the wings. In fact, Lepidoptera—the order of insects to which butterflies and moths belong—is Greek for "scaly wing."



# Atlas Moth

Imagine a bird in the rainforest. In the distance, it sees a potential snack: an Atlas moth (*Attacus atlas*), resting with closed wings on the trunk of a tree. The bird creeps closer, making no sounds, until it is within striking distance. Just as it's about to pounce, the moth's wings spring open—and boom! Instead of a moth, the bird sees not one, but *two* snake heads, appearing out of nowhere. Confused and startled, the bird flies away, and the moth gets to live another day.

Although scientists can never know for sure what goes through the mind of a bird or any other predator of the Atlas moth, the semblance of a snake's head in profile on each of the wings' upper corners is uncanny, at least to human eyes. Does the moth really use these markings to scare off predators?

Supporting evidence includes the fact that cobras (which the profile most resembles) live in the same part of the world as these moths; the moth's main predators (birds and lizards) are visual hunters; and related moth species have less developed versions of the snake's head—showing a progression that could have been honed by natural selection.

In addition to the "angry cobra" markings, the wings of the Atlas moth also contain translucent areas that may function as "eyespots." These false eyes are useful not only to startle predators, but also to divert attention from more vulnerable parts of the moth's body. If, say, a particularly stubborn predator decides to attack the eyespots, damage to the wings would not be as catastrophic as damage to the moth's head or body. In the bird-eat-bug world, a little ruse can mean the difference between life and death.

Photos: Kevin Twomey, Gerald and Buff Corsi (c) California Academy of Sciences (left)

# Golden Mantella Frog

Here's a word of warning for the princesses of the world: if you're hoping to meet your prince, you'd better find another frog to kiss. Although the golden mantella's bright orange skin is quite beautiful, it's also toxic. Like all mantella frogs, this tiny hopper secretes toxic chemicals called alkaloids from its skin, which often prove deadly—or at the very least distasteful—to predators. Scientists did not know how these frogs acquired their toxins until recently, when Academy entomologist Brian Fisher solved the mystery by looking at their diet: the mantellas were eating toxic ants. "The frogs have found a way to ingest the poisonous ants without harming themselves," explains Fisher.

Like stop signs, the mantellas' brightly colored bodies send a strong message to potential predators, effectively saying, "Stay away—I'm poisonous." While most other frogs are nocturnal, the mantellas are only active during the day, when predators can easily see their warning coloration. As long as the frogs have access to their toxin source, this is a highly effective strategy. However, as their habitat becomes degraded by human activity, the frogs have a harder time finding their toxic prey. Scientists have found that mantella frogs in degraded areas are less poisonous than their counterparts in pristine forests, making them more vulnerable to predators. "People often ask me why ants matter," says Fisher. "This relationship between Madagascar's toxic ants and toxic frogs is just one of the reasons. Without the right ants, these beautiful frogs could be decimated by predation. In many ways, ants are the glue that holds an ecosystem together."

Photos: Kevin Twomey, Devin Edmonds: www.amphibiancare.com (right)

## Where in the World

Golden mantellas *(Mantella aurantiaca)* live only on the island of Madagascar, where they prefer damp, swampy forest habitats. Critically endangered in the wild, their range is now limited to an area of about 10 square kilometers.

## Where in the Academy

These colorful frogs can be found in the Madagascar level of the Academy's Rainforests of the World exhibit. Keep your eyes peeled for both tadpoles and adults when you visit—Academy biologists are working to breed these frogs in captivity to help ensure the survival of the species.

## Sensitive Skin

Like all frogs, mantellas can "drink" through their skin, soaking up water without ever opening their mouths. However, this special talent makes them especially vulnerable whenever water conditions change. Scientists often use frogs to measure the overall health of an ecosystem, since they are some of the first animals to respond to pollutants.

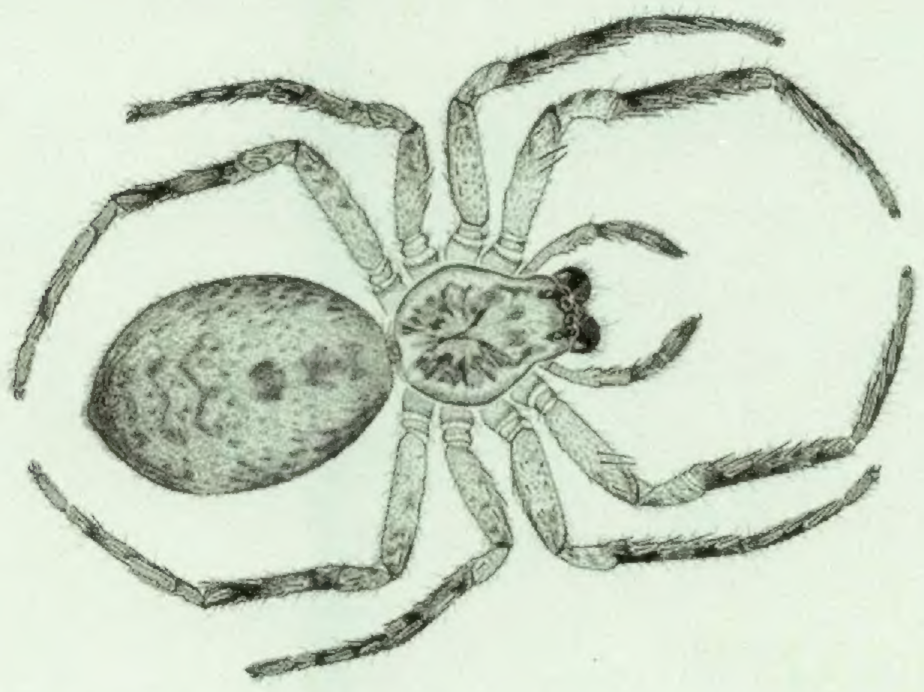
## Fancy Feet

Most frogs have webbed feet to help them swim. However, because mantellas spend their lives crawling around on land instead of swimming, they have no need for webbed toes. Adhesive discs on their toes help them keep their footing even on slippery leaf litter.

# Citizen Scientists at Work

## Hundreds of community members contribute to ongoing Academy research

ALTHOUGH INSECTS AND arachnids are among the most numerous animals on the planet, these tiny creatures can be tough to spot. The more eyes on the look-out, the better. That is the idea behind the Academy's citizen science surveys, which give anyone with an interest the chance to participate in real Academy research.



Arachnologists at the Academy have been tracking the local distribution and spread of *Zoropsis spinimana* spiders for over two years, and they are now expanding their search through a new project called "Bay Area's Most Wanted Spider." Citizen scientists are asked to photograph *Zoropsis* each time they see it, record data about where the sighting occurred, and send this information to the Academy.

Researchers will then identify the photographed spiders and plot each *Zoropsis* sighting on a distribution map. While harmless to humans, these 1.5 to 2-inch brown spiders are considered invasive. When an invasive species gains a foothold in new territory, it competes with native species for resources and has the potential to disrupt entire food chains. A geo-referenced database will increase understanding of how the *Zoropsis* population is impacting the Bay Area.

Those more interested in six-legged than eight-legged creatures can turn to the Bay Area Ant Survey instead, which was launched in 2004 to gather baseline data on local ant populations. Among the goals of this survey is a better understanding of the invasive Argentine ant (*Linepithema humile*), which is known to dominate native ants that are several times its size and deplete important food sources for other species.

To date, more than 800 citizen scientists have submitted ant specimens, which represent 34 distinct species found from Sonoma to Santa Cruz and everywhere in between. Community members can pick up collecting kits in the Academy's Naturalist Center and then mail in specimens for identification, or schedule an appointment to visit in person and identify the ants under a microscope. Each ant becomes part of the interactive AntWeb database at www.antweb.org/bayarea.jsp.

The Naturalist Center is located in the Koret-Taube Education Center on Level 3 of the new Academy, and is generously supported by the David B. Gold Foundation and the Dean Witter Foundation.

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**To participate in a citizen science program:**

- Visit www.calacademy.org/academy/exhibits/naturalist_center
- Call (415) 379-5494
- Email naturalist@calacademy.org

# Singapore to Bali: Exploring the Indonesian Archipelago

It's been called "the global epicenter of marine species diversity" and is known as the Coral Triangle—the region of ocean spanning from the Philippines to Indonesia and Papua New Guinea. As an expert in the evolution of nudibranchs, or sea slugs, Academy scientist Terry Gosliner has visited the Coral Triangle on countless research expeditions, each visit yielding new marine species never before documented. To date, researchers know the area is home to more than 3,000 species of reef fish and 600 corals.

In October, Gosliner and his wife Bonnie will share their passion for the Coral Triangle with Academy members when they lead the Singapore to Bali Expedition. The two-week voyage—aboard the luxury cruiser *Orion*—will take the travelers underwater (with snorkels) to see this incredible biodiversity for themselves. They will experience ancient cultures on some of Indonesia's remotest islands, and observe the flora and fauna of verdant rainforests and active volcanoes. The Gosliners' expertise will be complemented by social-cultural anthropologist Nancy Cooper and Charles Mandeville, a senior research scientist in the Department of Earth and Planetary Sciences at the American Museum of Natural History.

The itinerary will cross the area between Bali and Lombok known as "Wallace's Line," where naturalist Alfred Russell Wallace discovered the division between Asian and Australian fauna. "It's like two worlds colliding," Gosliner says. "The Indonesian archipelago was formed more than 100 million years ago when the Asian and the Australian/New Guinea Plates started coming together."

Among other high points will be a circumnavigation of Krakatau Island, epicenter of the world's most violent volcanic eruption in 1883. Volcanoes are key players in evolution, Gosliner explains. "Every time a volcano erupts, it changes current patterns and creates new habitats. By developing new landmasses, eruptions separate populations and provide the isolation needed to create new species."

Indonesia is a patchwork of cultures and peoples, and Academy guests will travel to areas few Westerners have experienced—from watching a village buffalo race to touring the sultan's palace. At the royal residence of Prince Mangkunegoro, guests will dine on Javanese specialties, and enjoy dance and gamelan performances. They will also visit Komodo Island, home to the wild Komodo dragon.

Gosliner has been leading Academy expeditions around the globe for more than 20 years. "This is not just eco-tourism. It's actual scientific exploration," he says. "It's a hands-on experience with a team of colleagues and a group of passengers hungry to learn new things. It's the best kind of learning there is."

## See the World through a Scientist's Eyes

### Expedition Highlights

- Discover the vast biodiversity of marine life—and possibly new species—in the rich waters of the Coral Triangle.
- Visit the ancient temple complex of Prambanan, the largest and most beautiful Hindu temple in Indonesia.
- Learn how waxes and dyes are used to produce ornate textiles at a family-owned batik workshop.
- Explore the lotus-shaped temple complex of Borobudur, one of Buddhism's most sacred places.
- Tour the former sultan's palace in Sumbawa Besar, where the sultan's daughter will share family stories, photos, and artifacts.

### Trip Details

Destination: Singapore to Bali Expedition, the Indonesian Archipelago

Dates: October 18 - 31, 2009

Vessel: The 106-passenger *Orion*

Guides: Bonnie and Dr. Terry Gosliner, Dr. Nancy Cooper, Dr. Charles Mandeville

Cost: From $11,990

### Upcoming Academy Adventures

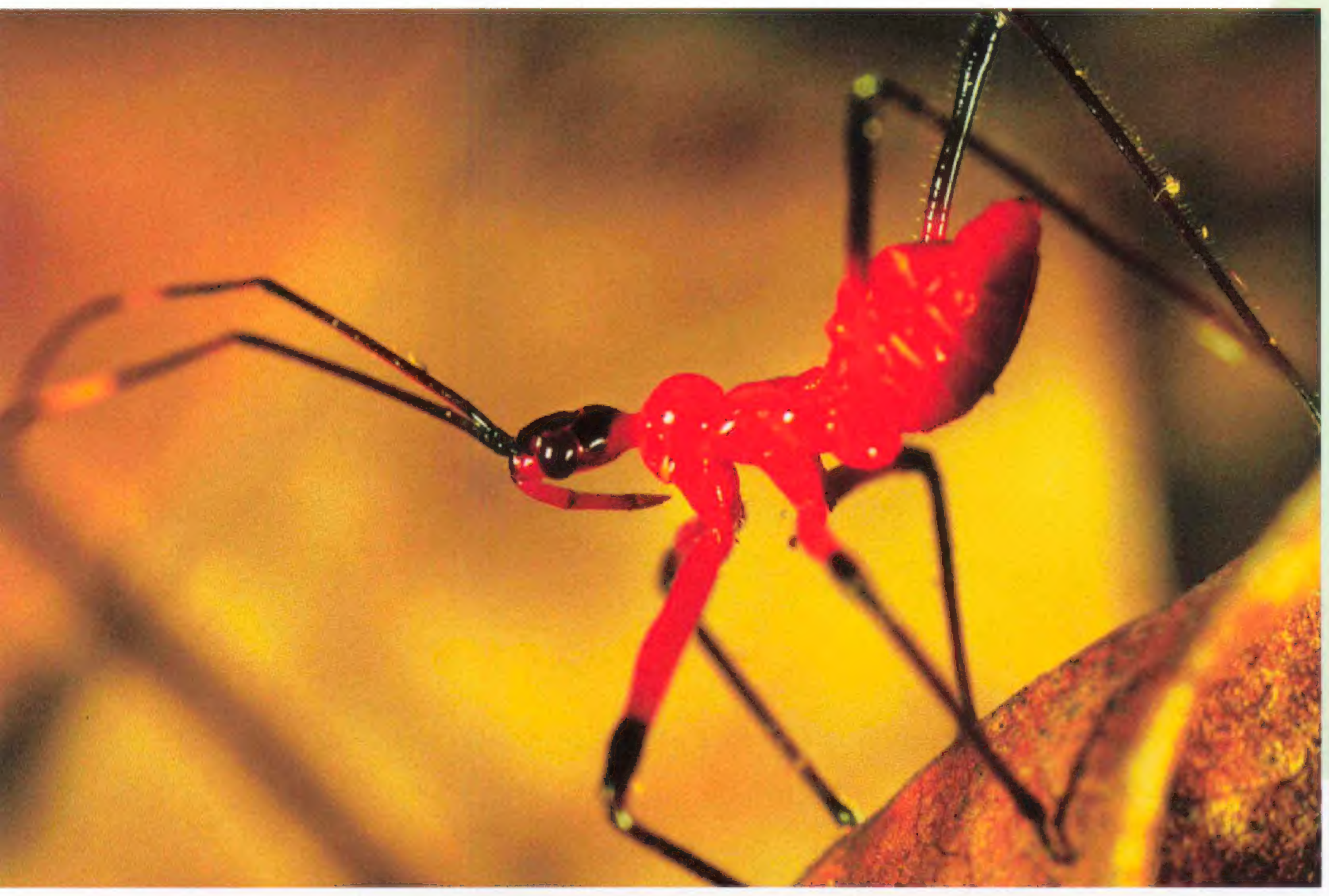
**Alaska's Coastal Wilderness**
August 29 - September 5, 2009
Academy Leaders:
John and Pam McCosker

**Cambodia & Vietnam, Aboard the *Mekong Pandaw***
October 20 - November 4, 2009
Academy Leader: Chris Andrews

A sample of the islands' diverse amphibians, reptiles, and arthropods.

# ISLANDS OF EVOLUTION

São Tomé



BY ANDREW NG

IN 2000, ACADEMY HERPETOLOGIST Robert Drewes visited a longtime family friend who had relocated to the tiny island nation of São Tomé and Príncipe. Located in the Gulf of Guinea off Africa's west coast, this former Portuguese colony was mostly unsurveyed by scientists, except for a few studies done in the 1800s. After hiking nearly 5,000 feet up an ancient volcano on São Tomé and beholding the lush green wilderness that blanketed the island, Drewes said to himself, "I am *definitely* coming back."

A man of his word, Drewes came back the following year to explore the

Photos by: Dong Lin, Wes Eckerman and Gary Williams

## The tiny African islands of São Tomé and Príncipe are teaching Academy scientists some big lessons about island biology.

great unknown, and he brought 10 other scientists with him. The Academy's first Gulf of Guinea expedition was fiercely interdisciplinary: herpetology, ichthyology, entomology, botany, arachnology, and mammalogy were all represented. In the three additional expeditions since then (in 2006, 2008, and 2009), Drewes enticed several marine biologists and even a mycologist—a mushroom specialist—to join as well.

"It was an absolute joy to bring all those scientists out there to study the poorly known organisms," Drewes says. "It's a very stimulating environment. The tradition of interdisciplinary expeditions goes all the way back to the Academy's 1905-06 Galapagos voyage."

Over the past nine years, a total of 25 explorers have made the trip to São Tomé and Príncipe: Academy curators, collections managers, postdoctoral fellows, graduate students, and photographers. They trekked through hot, humid rainforests, scaled giant volcanic pillars, scoured tidepools, and seined through the islands' numerous freshwater streams. They braved malaria, capsized boats, and near-drownings. While nine papers have already been published describing the islands' biodiversity, more are still to come: hundreds of specimens stored at the Academy await identification and cataloguing, and the secrets they hold are just beginning to be revealed.

When reflecting on their experiences, the various Academy scientists who have worked in São Tomé and Príncipe invariably wax poetic on the kindness of the islands' inhabitants, the stimulation of working with colleagues, and the pristine nature of the islands. They also all agree on two things: the islands not only provide living, breathing examples of numerous biological principles, but they also provide a dream laboratory for scientists who are passionate about discovery and biodiversity.

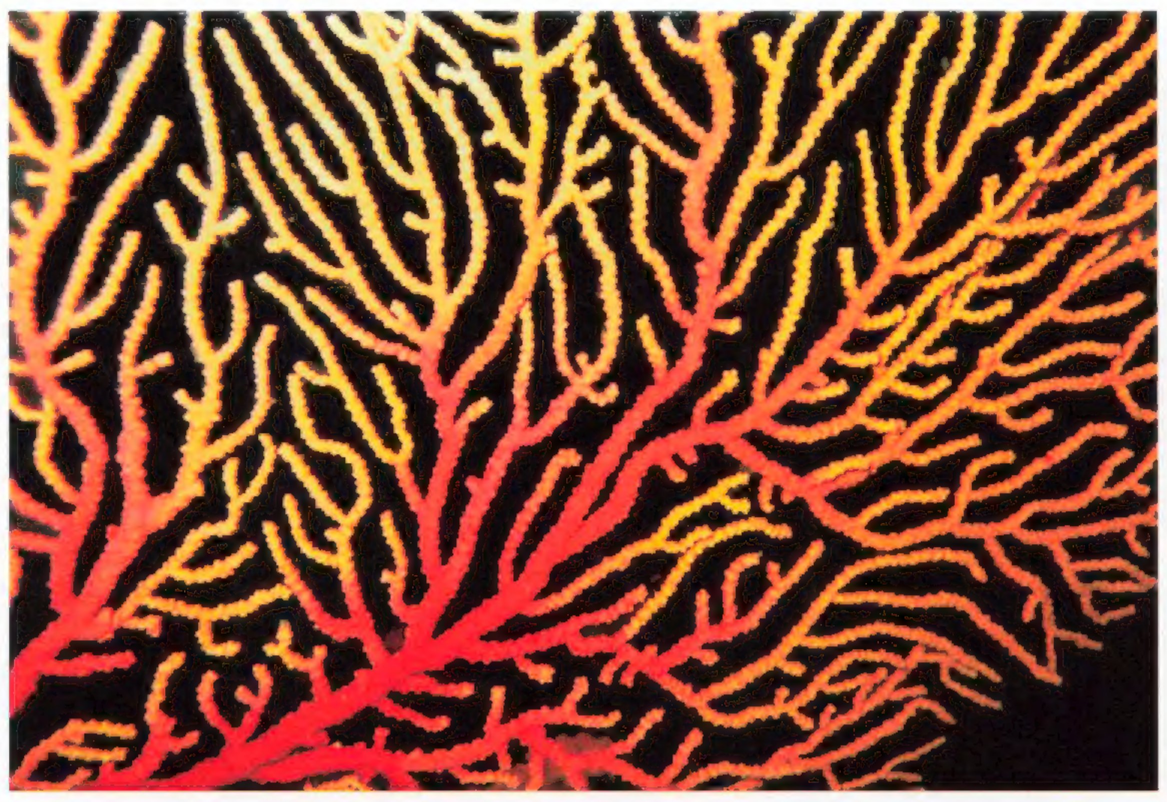
ONE COULD PROBABLY CRAFT AN entire college course on evolution using São Tomé and Príncipe as a case study. As Drewes explains, "Scientists love islands because everything is simpler there—evolutionary processes are distilled." Many biological principles are beautifully illustrated in the Gulf of Guinea; the topics that follow would each merit their own lecture.

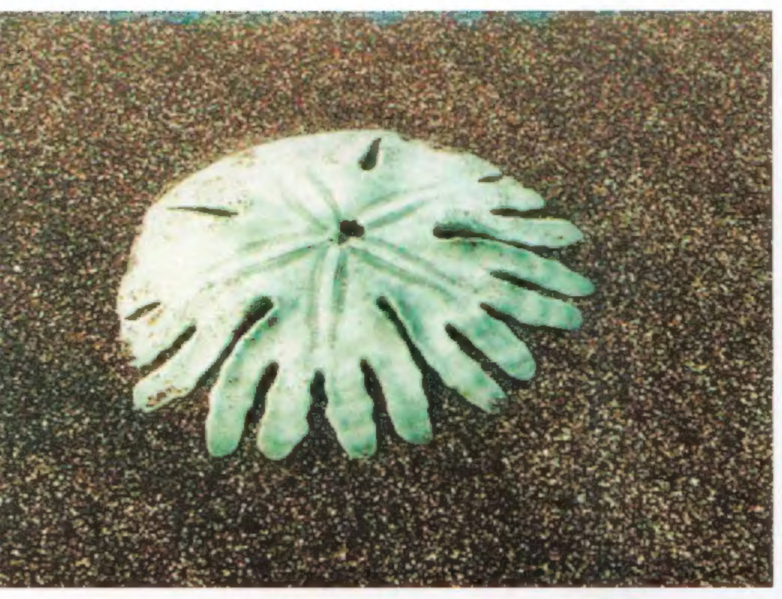
**Island gigantism** is the phenomenon, still not fully explained, of some species attaining large sizes compared to their mainland counterparts when they colonize a more sparsely populated island. Jumbo creatures may possess a number of selective advantages, including the ability to feed on a wider range of resources, and to give birth to larger litters or clutches. Heftier individuals also tend to dominate others of their kind in conflicts over resources. And because they have greater stores of energy and water, they can better survive famine and drought. The islands of São Tomé and Príncipe are home to the world's largest begonia (well over 10 feet tall), the world's largest sunbird and weaver, and Africa's largest treefrog. Dwarfism is also seen on the islands, which are home to the world's smallest ibis. Small size has its own set of advantages, since these animals need fewer resources to survive and reproduce.

**Endemism**, the state of being unique to a particular geographic location, is an important concept on islands, which typically have a high percentage of endemic species because of their geographic isolation. One of the strongest arguments that can be made for establishing conservation areas is the presence of these unique species. São Tomé and Príncipe are home to many endemics, including geckos, frogs, caecilians, legless skinks, shrimp plants, and shrews.

**Disharmony**, the absence or overabundance of certain species compared to the mainland, is another common occurrence on islands. Academy scientist Charles Griswold found São Tomé and Príncipe to be disharmonious in that there were no *Dorylus* ants (a widespread genus in Africa)—but at the same time, he says, "There were more carabid beetles running around at night than anywhere else on Earth." At least the spiders were harmonic, closely mirroring their diversity on the mainland.

**Convergent evolution** occurs when multiple lineages independently evolve similar traits because they occupy similar niches. Echinoderm specialist Rich Mooi found a species of sand dollar on São Tomé, *Rotula deciesdigitata*, that has evolved holes and notches that closely resemble the pattern seen on Caribbean sand dollars. These embellishments





The islands provide a dream laboratory for scientists who are passionate about discovery and biodiversity.

The islands' biodiversity has been shaped by millions of years of isolation from the mainland.

help the disk-shaped animals resist being swept away by water currents. "It was an astounding convergence in hydrodynamic structure," says Mooi.

**Island colonization** is the random arrival and subsequent spread of new species on an island. Plants and insects might get blown by the wind, and birds can fly, but how do shrews and frogs cross over 100 miles of ocean? "With any creature on São Tomé and Príncipe, my null hypothesis is that they were brought by humans," says Drewes. "The monkeys and rats, for example, were human introductions. However, my null hypothesis has been negated time and time again with respect to the amphibians." To explain the presence of amphibians, which cannot survive in saltwater, Drewes has developed a rafting hypothesis in which giant chunks of land break off from the mainland, float down the Niger and Congo Rivers into the Gulf of Guinea, and are carried by prevailing currents toward São Tomé and Príncipe. His hypothesis is further strengthened by the fact that during the rainy season, the gulf waters turn brackish—mitigating the effect that saltwater might have on frogs and other amphibians.

**Marine dispersal** is the spread of populations in the ocean. One might think that marine organisms face no barrier to dispersal, but ocean currents, underwater terrain, and temperature differences are just a few factors that influence when and where a sea creature settles down. Like their terrestrial counterparts, Academy marine biologists have discovered a range of biogeographic patterns. Coral specialist Gary Williams saw forests of octocorals around Príncipe, but only scattered individuals around São Tomé. Invertebrate zoologist Bob Van Syoc found that very few barnacles have arrived from mainland Africa, 100 miles away. At the same time, Rich Mooi found the urchin fauna to be almost identical to that in the Caribbean, 5,000 miles away.

The biggest challenge Drewes faces is how to communicate the uniqueness of São Tomé and Príncipe to its citizens.

"EACH OF US HAD OUR OWN REASONS for going there," says entomologist Norm Penny. Indeed, the multitude of personal quests, academic yearnings, and moments of triumph during the Gulf of Guinea expeditions is remarkable considering that they played out on such tiny islands.

Charles Griswold, for example, wanted to find a spider he had written about in 1985 but had never seen. In fact, only one specimen existed anywhere in the world's collections. "Within an hour of arriving on Príncipe, I found three specimens," he says.

Rich Mooi and Robert Drewes almost drowned in the choppy waters off São Tomé as they searched for living sand dollars, which are essential for DNA studies. "If I had been swept out to sea, I wouldn't have stopped until I reached Angola," says Mooi. "But during one fleeting moment, as I bobbed up and down on the 10-foot swells, I thought I caught a glimpse of living sand dollars down on the ocean bottom. That was very exciting."

When graduate student Rebecca Wenk traveled to the islands with her mentor Tom Daniel, she had one thing on her mind: finding *Elytraria marginata*, a foot-tall herb with tiny white flowers that was part of her master's thesis. After spending 10 days on São Tomé with no success, she had given up hope. But then she flew to Príncipe, and while looking out the car window she saw something familiar growing by the side of the road.

"I yelled, 'Stop! Stop!' and jumped out of the car," says Wenk. "I had been working on this genus for four years, and this was the first time I saw it in the wild. It really was a miracle."

"She went ballistic," says Drewes.

"One of the beauties of the Gulf of Guinea project is that Bob Drewes encouraged people from all different disciplines to go," says ichthyologist Tomio Iwamoto. "He got someone like me, a deep-sea guy, to explore the freshwater streams. That's telling you something."

INDEED, DREWES' ENTHUSIASM FOR THE islands is contagious.

"I've been doing science for a long, long time," he says. "I've spent 35 years studying mainland Africa, which can be a tough place. I've published several books. But the Gulf of Guinea project is a mission to me: an opportunity not just to study it for knowledge's sake, but also to make a difference for an entire nation."

The biggest challenge that Drewes faces is how to communicate the uniqueness of São Tomé and Príncipe to its citizens. The country's isolation, economic state, Portuguese creole language, and lack of a university are proving to be formidable hurdles. "I thought of creating a unit for their high schools about the country's biology, or perhaps building a natural history exhibit," he says. "I'm looking for ideas."

But Drewes has already made inroads. He always informs the Ministry of the Environment about

Some of the Academy scientists who have visited the islands.

Academy visits. He sends or hand-carries all scientific publications to the government. He and his colleagues have met government officials on several occasions; during the 2009 expedition, the scientists had dinner with the leader of Príncipe, who expressed interest in fostering conservation. The scientists have also been interviewed twice by the local television station.

But time is running out. The prospect of oil looms on the horizon, both literally and figuratively. Since the late 1990s, interest in the Gulf of Guinea as the new Persian Gulf has skyrocketed. (A 2002 article in *The New Yorker* proclaimed "Our New Best Friend: Who Needs Saudi Arabia When You've Got São Tomé?") In 2004, the country sold its first production licenses to tap into the estimated four billion barrels of oil lying within its exclusive economic zone. São Tomé and Príncipe will undoubtedly face many crucial decisions in the coming years, as oil revenue spurs development in the tiny country's infrastructure, industry, and commerce. Fortunately, the work of Drewes and his colleagues—amassed over nine years and counting—is available to help the government conserve their biological treasures amid this inexorable change.

As the islands face decisions about future development, they are informed by the scientists' efforts to conserve their biological treasures.

## São Tomé and Príncipe: Fast Facts

**Location:** At 1°N, 7°E, it is near "the center of the world"—the intersection of the equator and prime meridian

**Area:** 370 square miles (about eight times the size of San Francisco)

**Population:** 213,000 (2009 estimate)

**Official Language:** Portuguese

**Geology:** Part of a line of volcanoes that includes the Cameroon highlands and Mount Cameroon on mainland Africa, and the islands of Bioko and Annobon in the Gulf of Guinea. Príncipe formed about 30 million years ago; São Tomé, 17 million years ago.

**History:** Portuguese explorers discovered the uninhabited islands of São Tomé and Príncipe around 1470. Using the islands as a way station to Brazil, the Portuguese imported slaves from mainland Africa and established sugar, cacao, and coffee plantations. São Tomé and Príncipe became independent in 1975.

**Online Resources:** Using the Internet to make their discoveries widely available has always been a priority for the Gulf of Guinea scientists. Read about their first expedition in the article "Islands at the Center of the World," published in 2002 (research.calacademy.org/calwild/2002spring/stories/saotome.html). Keep up-to-date on the Gulf of Guinea project with Robert Drewes' blog (www.calacademy.org/medialibrary/blogs/gulfofguinea). And scroll through image galleries of the island's flora and fauna (www.calacademy.org/gallery).

# Lectures

## Benjamin Dean Lecture

**Price:** $5 for members, $10 non-member adults, $8 non-member seniors. Seating is limited. Purchase tickets by calling (800) 794-7576.

### The New Mars: Habitability of a Neighbor World

**Monday, June 1 at 7:30 pm**
David Des Marais
NASA Ames Research Center

Of all the other planets in the solar system, Mars is the one whose past climate most closely resembled the Earth's. Recent missions have revealed richly fascinating landscapes and important discoveries on Mars. The red planet might have supported life sometime in the past, and perhaps supports life even today.

### Habitable Worlds in the Universe: The Search Begins

**Monday, July 6 at 7:30 pm**
Geoff Marcy
University of California, Berkeley

*Encore lecture: updated with new information from NASA's Kepler planet-hunting spacecraft.* In 2009, astronomers will launch the first searches for Earth-like worlds around other stars, using bizarre, extreme telescopes for the task. These telescopes fundamentally supersede Galileo's historic little scope for the first time. A wild race for signs of inhabited worlds and extraterrestrial life is about to begin.

### Astrobiology, Planetary Protection, and Hitchhikers in the Solar System

**Monday, August 3 at 7:30 pm**
Margaret Race, SETI Institute

This talk will provide a behind-the-scenes view of how experts from many different disciplines contribute to searches for extraterrestrial life—and also explain how the Outer Space Treaty and planetary protection policies urge "responsible exploration" when visiting other planets. The breadth and depth of pre-planning may surprise you.

## Author Talk

**Price:** Free with Academy admission. To reserve a seat call (800) 794-7576.

### *A is for Anaconda:* The Imagination of an Artist

**Saturday, June 6 at 1:30 pm**

Bay Area artist Laura Regan will use her rainforest alphabet book, *A is for Anaconda*, as a springboard to discuss her creative process and her influences from childhood. A book signing will follow the talk. This program is for adults and children ages 6 and older.

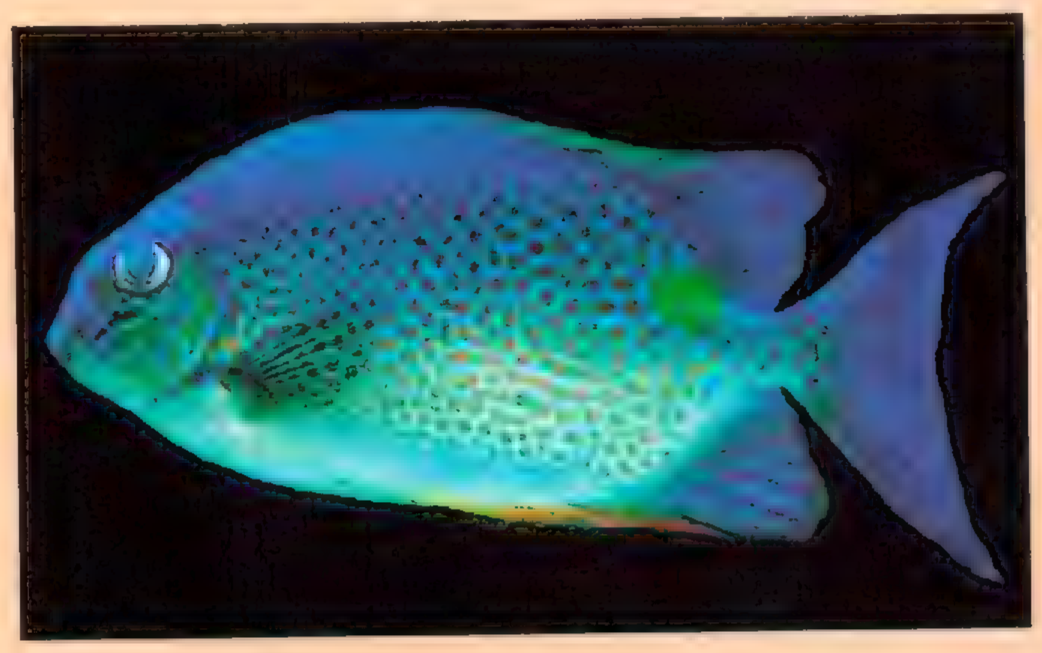
## Pritzker Lecture

**Price:** Free for members, $10 non-member adults, $8 non-member seniors. Seating is limited. Reserve a seat or purchase lecture tickets by calling (800) 794-7576 or online at calacademy.org/events.

### Diagnosis: Mercury, Money, Politics, and Poison

**Tuesday, June 9 at 6:30 pm**
Dr. Jane Hightower

A San Francisco physician, Hightower is widely acknowledged as the first doctor in the U.S. to correlate mercury poisoning with fish consumption. Hightower will discuss the competing interests, varying government standards, and other hurdles she faced while trying to call attention to the problem of mercury poisoning.



# Book Groups

## Bookworms (Adult Book Group)

**Price:** Free. Reserve a space by calling the Naturalist Center at (415) 379-5494.

### Why Do Oceans Matter?

**Tuesday, June 16 at 6:30 pm**

*Note: Bookworms will not meet in July and August, but will resume in September.*

In recognition of World Oceans Day (June 8), the adult book group will discuss *Sea Change: A Message of the Oceans* by noted marine biologist Sylvia Earle. *Sea Change* is both a plea for ocean conservation and a very personal story of Earle's lifelong exploration of the deep sea.

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## Teens Talk Books

**Price:** Free with Academy admission. Reserve a space by calling the Naturalist Center at (415) 379-5494.

### Underwater Explorations

**Saturday, June 6 at 11:00 am**

Whether facing a great white shark, chasing orcas near Vancouver, or swimming with hordes of hammerheads in the Sea of Cortez, Peter Benchley (author of *Jaws*) shares his many underwater adventures in the book *Shark Life: True Stories about Sharks and the Sea.* Join a teenage discussion of *Shark Life* and its insights into shark biology, safe swimming practices, and ocean conservation.

### The Carbon Challenge

**Saturday, August 1 at 11:00 am**

In Saci Lloyd's *The Carbon Diaries 2015*, it's the near future and global warming has created a "Great Storm" that hits London. In response, Great Britain decides to implement carbon rationing—each person is allotted a miniscule amount of carbon use per year. Good-bye air travel and home heating. Join a teenage discussion of *The Carbon Diaries 2015*, which is told through the words of a 16-year-old Londoner.

## Naturalist Center

Located on Level 3 above African Hall in the Koret-Taube Education Center, the Naturalist Center is your stop for questions about the natural world. In addition to books, DVDs, and specimens, the Naturalist Center offers a variety of fun programs.

**Science Up-Close**
**Every Wednesday at 11:30 am**
In these mini-presentations, find out more about a different Naturalist Center specimen each week.

**Story Time**
**Every Sunday at 1:30 pm**
Enjoy stories and crafts related to the natural world. Appropriate for school-aged children. **Note:** On Tuesday, July 14 at 2:00 pm, join a special Story Time with local artist and author Elizabeth Martin, as she reads from her colorful and informative picture book *The Day Henry Jumps into the Sea*. Reserve a seat by calling (800) 794-7576.

**Explore Golden Gate Park with the Naturalists**
**Tuesdays, June 2, July 14, and August 4**
**9:30 am – 12:30 pm**
**Tuesdays, June 9, July 7, and August 25**
**1:00 – 4:00 pm**
Learn about the Academy's wild neighbors in Golden Gate Park, the fragile ecosystems where they live, and what you can do to help protect them. For ages 7 and older (children 7-12 must be accompanied by a parent). Participants should wear comfortable clothes and sturdy shoes for outdoor activities. Meet at the Business Entrance reception desk. **Price:** Academy admission plus $3 per person. Reservations required by calling (415) 379-8000 (press "0" for a representative). Limited to 30 people.

**Explore the Living Roof with Naturalists**
**Every Monday starting June 22**
**3:30 – 4:30 pm**
Learn about the Academy's 2.5-acre living roof and the birds, bees, and other animals that visit its 1.7 million native plants. Meet in the Naturalist Center.

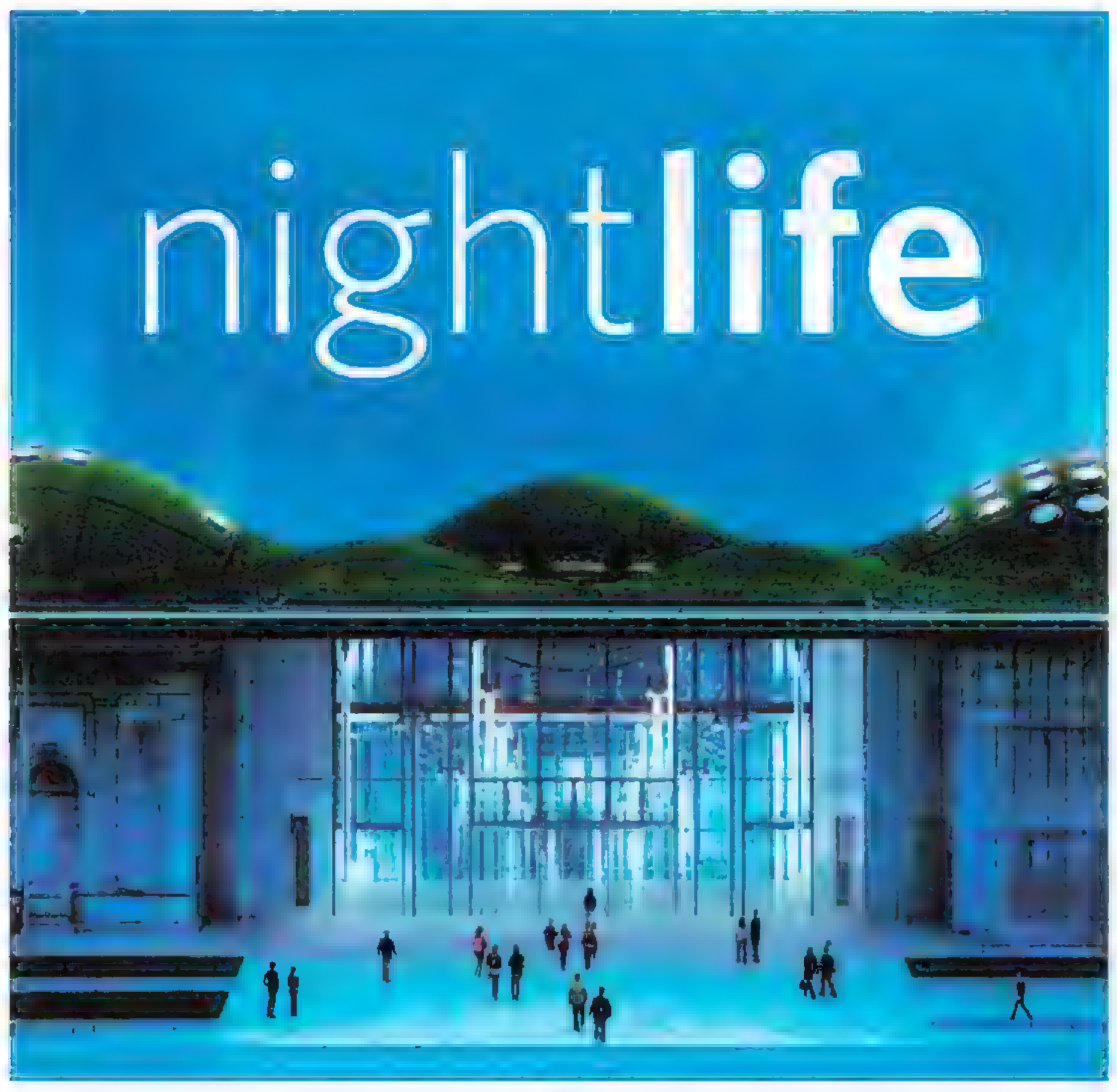
**The Living Roof Project**
**Thursdays, July 23 and August 20**
**9:30 am – 12:30 pm**
**Sundays, June 28, July 19, and August 16**
**9:30 am – 12:30 pm**
Become a citizen scientist and help collect data for a long-term monitoring project on the Academy's living roof. Along the way, learn about the roof's native plants and animal visitors. For ages 12 and older. Participants should wear clothing for outdoor activities. Meet at the Business Entrance reception desk.
**Price:** Academy admission plus $3 per person. Reservations required by calling (415) 379-8000 (press "0" for a representative). Limited to 15 people.

## World Oceans Day

**On February 12, the United Nations issued an official resolution designating June 8, 2009 as the first annual World Oceans Day.**

The Academy's scientists—and its thousands of aquatic residents—will help visitors celebrate this international event with a suite of special programs about the most important resource on the planet: water. In the month of June, take a sip from the museum's ocean-related program offerings, including a weekend of festivities (June 6-7), a Teens Talk Books meeting about *Shark Life* (June 6), a NightLife focusing on sustainable seafood (June 11), and a Bookworms discussion of Sylvia Earle's *Sea Change* (June 16). Check www.calacademy.org/events for details.

## NightLife



**Every Thursday night 6:00 – 10:00 pm**

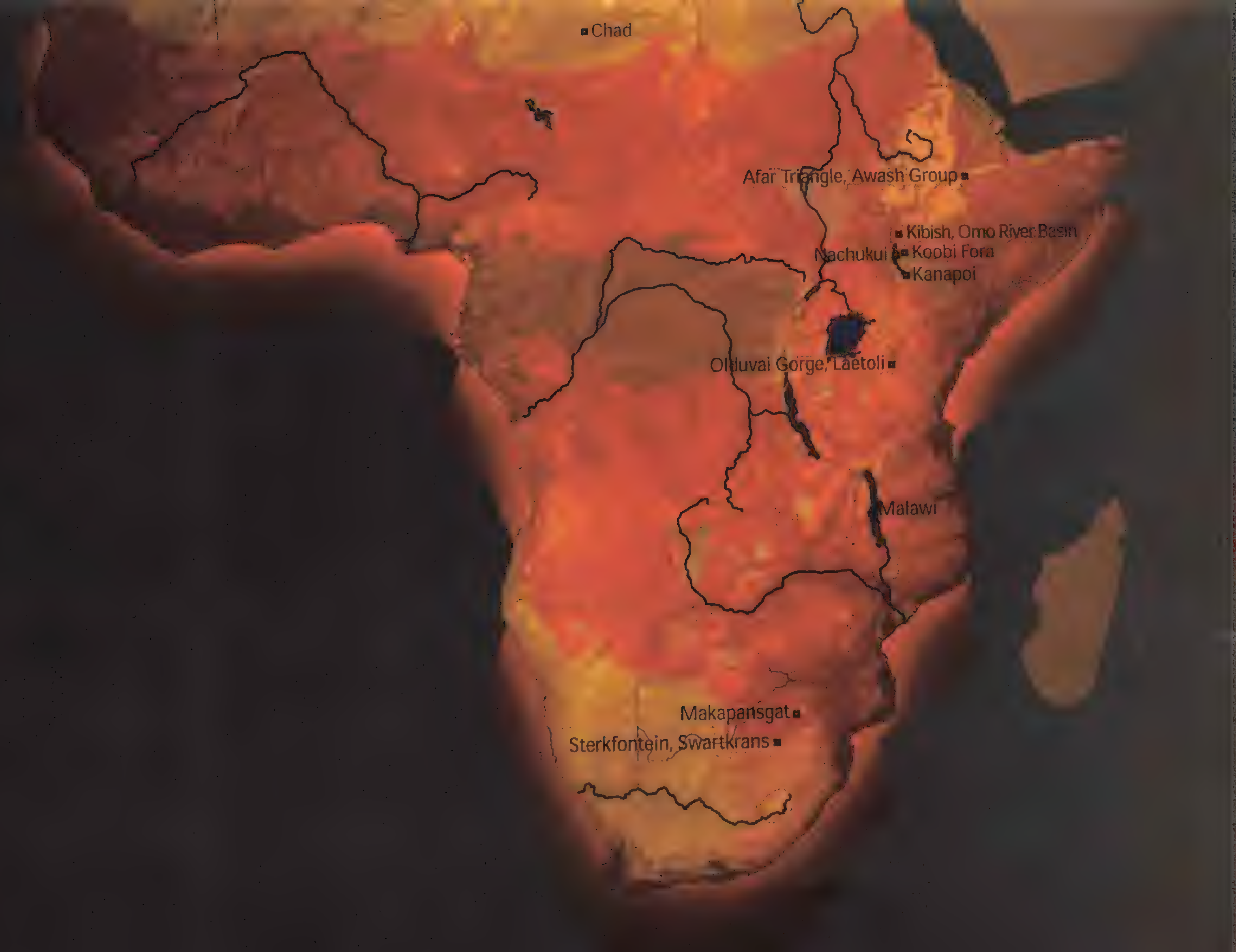
The Academy's weekly after-hours event continues this summer with great music and rockin' science. Highlights in June include a focus on sustainable seafood with the San Francisco Seafood Watch Alliance (June 11), Qool DJs and *Science in Action* stories (June 18), and a lecture entitled "How Animals Do It" by Jane Tollini (June 25).

**NightLife admission:** $8 members, $10 non-members. Must be age 21 or older; a valid ID is required for entry.
More info: www.calacademy.org/nightlife.

## Family Programs

**Family Nature Crafts**
**Every Saturday and Sunday, June 20 – September 6**
**11:00 am – 12:30 pm**
Families with children ages 4 to 8 are invited to make nature-themed crafts. Space is limited. Check lobby for location.

**Explore!**
**Every Saturday and Sunday, June 20 – September 6**
**3:00 pm**
Stop by for lively science talks, fun animal demos, and investigations into the wild side of life. Check lobby for location.



# WALKING AMONG OUR

BY STEPHANIE STONE

WITH AN OFFICE FULL OF fossils, an impressive command of five languages, and a smile that is practically the definition of charm, it would be easy to characterize Dr. Zeresenay Alemseged as a modern-day Indiana Jones. However, the Academy's new Curator of Anthropology is quick to point out that his work is not usually as glamorous as the movies might have you believe. Over the past decade, Alemseged has spent nine field seasons conducting painstakingly systematic research in one of the hottest places on the planet, the harsh desert landscape of Ethiopia's Awash Valley. His project site—a 200-square-mile patch of dry, rocky earth known as the Dikika research area—is located more than 300 miles northeast of Addis Ababa and is a long, uncomfortable drive from the nearest small town. It is also sorely lacking in basic luxuries like paved roads, cell phone towers, and running water.

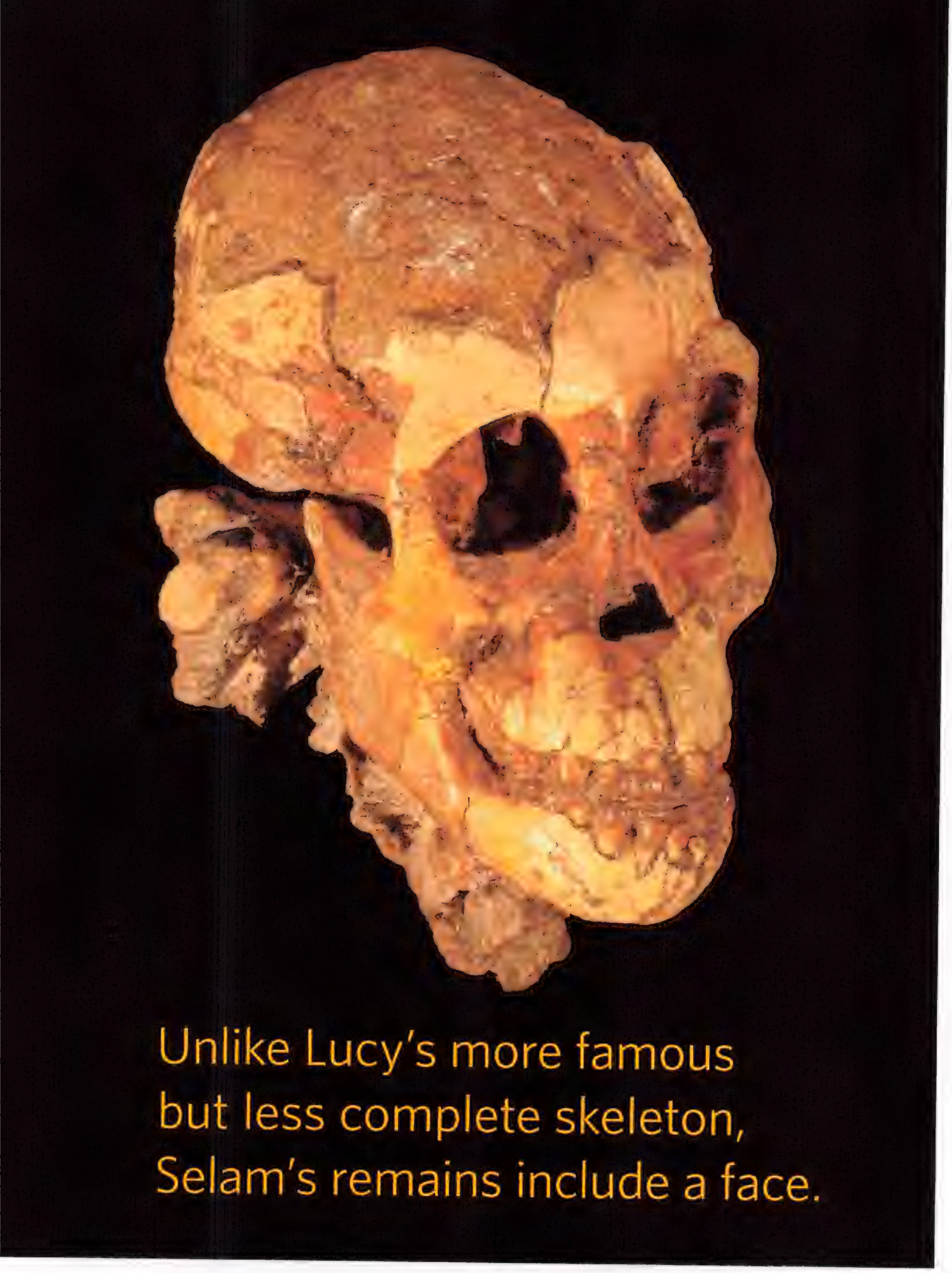
"In 1999, I was the first person to drive a car to the site," says Alemseged on one of his first days back in the office after the 2009 field season. "Each time I return to the field, I have to carry a whole village with me, because there is literally nothing there." Once a small encampment of just himself and six assistants, Alemseged's village now includes a fleet of vehicles and tents for over 40 people, including scientists with complementary areas of expertise. Throughout the two-month field season, the camp runs on a grueling schedule, with a wake-up call at 5:30 a.m., seven days a week. "The desert isn't the most comfortable place to be," Alemseged explains, "so as long as we're there, we want to make use of every moment."

Despite the long hours and the inability to take a comfortable shower at the end of a dusty day, it is easy to get excited about working at Dikika. The site boasts thick sedimentary deposits that span the perfect timeframe for finding human ancestors: about 4 million to 100,000 years ago. Over the years, tectonic activity and erosion have worked in tandem to expose thousands of fossils from their burial grounds, making the site a paleoanthropologist's paradise.

Photo by: Sharon Beals

Scouring the Ethiopian desert in search of clues to our past, Academy paleoanthropologist Zeresenay Alemseged finds new answers and more questions.

# ANCESTORS



Unlike Lucy's more famous but less complete skeleton, Selam's remains include a face.

"It's an amazing experience to be at Dikika," says Alemseged. "Today, the occasional bush or warthog is the only living thing in sight. But once you start walking, there are fossils underfoot with practically every step. And the bones are not from desert-dwellers—they are the remains of an extinct ecosystem that included hippos, elephants, rhinos, pigs, crocodiles, and, of course, early hominins. You realize that you are visiting an African game park that no longer exists, and as you walk through the park, you become the first modern human to greet our ancestors there." This ghostly safari has much to teach us, not just about the way our predecessors looked, but also about the environmental conditions that shaped the trajectory of human evolution.

ALEMSEGED HAS MADE SEVERAL important discoveries in Dikika, but his most famous find to date is undoubtedly the remarkably well-preserved skeleton of a small girl who lived about 3.3 million years ago and died at the tender age of three. Like Lucy, who revolutionized the story of human evolution when she was unearthed in 1974, the Dikika child was a member of the species *Australopithecus afarensis*. Because of this kinship, the international press quickly nicknamed the child "Lucy's Daughter." However, Alemseged prefers to call the girl Selam (meaning "peace" in the local Ethiopian language), since his fossil is actually more than 150,000 years older than Lucy. Excavated over the course of four separate field seasons, Selam not only represents the most complete ancient infant unearthed so far, but also perhaps the most diagnostic example of her species. Unlike Lucy's more famous but less complete skeleton, Selam's remains include fingers, a foot, a full torso, and—more importantly—a face.

"This type of preservation almost never happens," says Alemseged, still in awe more than eight years after he laid eyes on the tiny bundle of bones for the first time. "When she died, she was probably not far from a river delta, so it's possible that she was washed away in a flash flood and buried immediately."

Selam's skeleton offers a wealth of knowledge about human evolution, not just because it is so well preserved, but also because it occupies a near equidistant position on the trajectory from the common ancestor we share with apes to modern humans. "Based on the size of her three-year-old brain, there are hints that the growth rate of Selam's brain was more human-like than ape-like," explains Alemseged. A slower-growing, but ultimately larger, brain is one of the hallmarks of modern humans and accounts for the fact that human children are dependent on their parents for longer periods of time. Additionally, Selam's foot and lower leg provide clear evidence that she walked upright like modern humans. However, her shoulder blades were more gorilla-like than human-like, which means she might still have spent some time climbing trees. And when it came to vocalizations, Selam almost certainly sounded more like an ape. Her hyoid bone—a bone that later became crucial to human speech—closely resembles those of chimps and gorillas.

WHILE SELAM HAS GARNERED the lion's share of the interest in Alemseged's Dikika research project, her skeleton is just one of many that are helping him piece together the history of human evolution in Ethiopia. The non-human fossils he has unearthed provide equally important information, including critical clues about the environmental changes that spurred major adaptations in our ancestors. By mapping the shifting percentages of animals that favor a specific habitat over time, Alemseged has been able to reconstruct the major environmental trends in parts of Ethiopia over the past 4 million years. For instance, when he saw that grazers like wildebeest and their ancient relatives became more frequent 2.4 million years ago, he could infer that grasslands were becoming more dominant then. And as animals that fed on marsh grasses became more pervasive about 100,000 years later, he could track the spread of swamp grasslands. This shift toward a more open, less wooded environment corresponds to the first appearance of *Australopithecus boisei*, a cousin in our family tree that went extinct about a million years ago. It is also considered to be one of the evolutionary forces behind the eventual long-legged, short-armed build of *Homo erectus*, the hominid that emerged about 1.6 million years ago and became the first to leave Africa.

When asked to sum up his work in Ethiopia, Alemseged first clears up a common misconception. "I'm not a human fossil hunter," he says with a smile. "For one thing, that would be pretty boring, because you don't find hominin remains very often! But also, if you didn't look at the fossil record as a whole, you'd miss so much of the story about what we are and where we came from." Admittedly, that story still has blank chapters; the fossil record, by nature of the precise conditions necessary for a fossil to form and then be found, is still fragmentary, and our ability to interpret it is still growing. But thanks to fossils like Lucy and Selam, the basic outline is now firmly in place, and new details are being added every day. As Alemseged begins to analyze the results of his fruitful 2009 field season, he hopes to flesh out the story even further.

## Human Evolution Highlights

**About 6-7 million years ago:**
The earliest human ancestor diverged from the ape family and began the transition toward walking upright. Genetic evidence confirms that our closest living relative is the chimpanzee, with whom we share 98.6% of our DNA.

**About 4 million years ago:**
Members of the genus *Australopithecus* make their first appearance in the fossil record. Large teeth and thick enamel allowed these hominids to begin eating tubers and other abrasive foods for the first time.

**About 2.5-3 million years ago:**
Our ancestors began making and using stone tools to eat meat. Fossils from this time period show evidence of butchering.

**About 1.5-2 million years ago:**
*Homo erectus* emerges for the first time. With long legs and short arms, this early human is well adapted to walking long distances, and it begins to cover a much larger range, eventually becoming the first hominid to spread to other continents.

**About 800,000 years ago:**
Although it is difficult to document because of the frequent presence of natural fires, scientists believe that human ancestors first began domesticating fire around this time.

**130,000-195,000 years ago:**
Humans *(Homo sapiens sapiens)* are now fully modern. Compared to earlier members of the genus *Homo*, modern humans have larger brains and lighter skeletons.

# skyguide

## Mercury

36 million miles from the Sun

Elusive Mercury is a morning object in June, rising before dawn against the stars of Taurus the Bull. Descending into the Sun's glow by early July, it is at superior conjunction July 14. With binoculars, look low in the west for Mercury to the right of the crescent Moon soon after sunset July 22, next to the star Regulus August 1 & 2, next to Saturn August 14-18, forming a tight triangle with Saturn and the crescent Moon soon after sunset August 21, and finally in-line between the Moon and Saturn August 22. After that, it sets at about the same time as Saturn.

## Venus

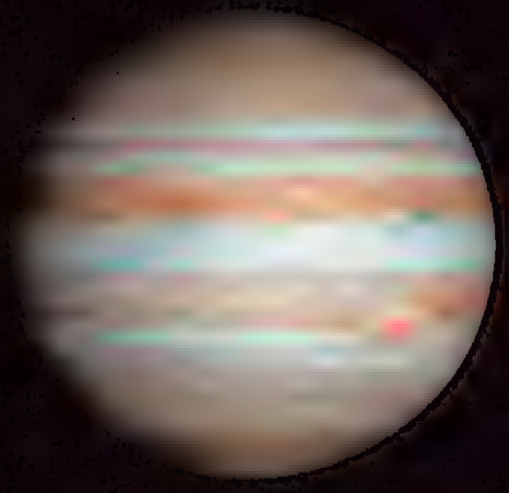
67.2 million miles from the Sun

The brightest of the planets is a morning object all season, dominating the eastern sky before dawn against the stars of Pisces and Aries in June, Taurus in July, and Gemini in August. The waning crescent Moon passes nearby on the mornings of June 19 (with Mars between them), July 19, and August 17.

## Mars

141.6 million miles from the Sun

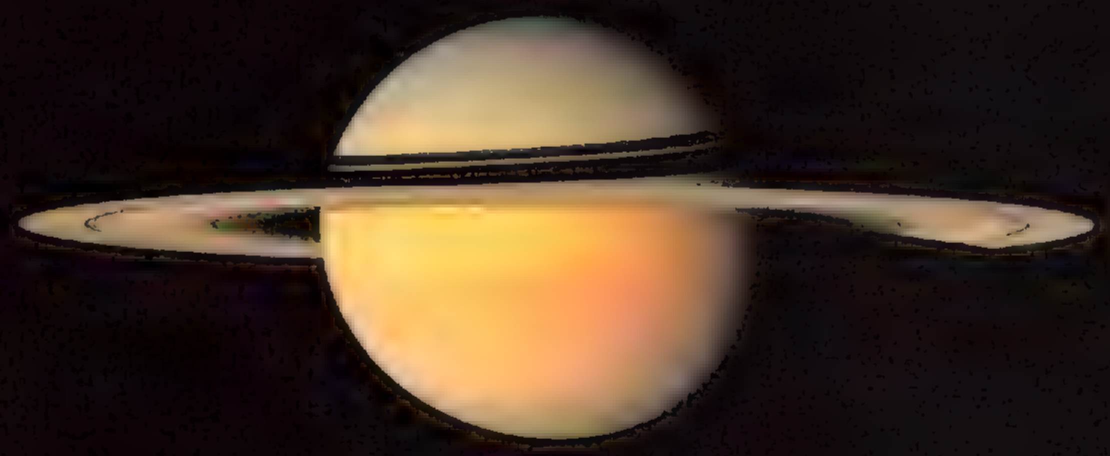
Like Venus, the red planet Mars is a morning object, keeping station near much brighter Venus in June, as the two pass through the stars of Pisces and Aries together. By July, the two planets separate from one another, with Mars rising gradually earlier each successive morning and passing through Taurus. Look five degrees north of Mars on the morning of July 11 for the Pleiades star cluster. The waning crescent Moon passes nearby on the mornings of June 19 (with Venus just south of Mars), July 18, and August 15 & 16.



## Jupiter

483.6 million miles from the Sun

Located against Capricornus the Sea-Goat, the largest planet rises shortly after midnight in early June, and slightly earlier each night. By late July, it rises before 10 pm. At opposition on August 14, it rises at sunset and is visible all night. On July 9, it passes faint, distant Neptune (only visible via telescope). More easily visible are the close passes by the Moon on June 12, July 10 & August 6.



## Saturn

886.7 million miles from the Sun

Loitering in Leo the Lion, the Ringed Planet is high in the west after sunset at the beginning of June, gradually descending into the Sun's glow by mid-August, effectively disappearing from the evening sky by the end of the month. All year, Saturn's thin rings have been oriented nearly edge-on to Earth, making them difficult to see. However, through medium-size telescopes, the largest of Saturn's 61 known moons can be easily observed. The waxing crescent Moon passes nearby on the evenings of June 27 and July 24. Saturn and Mercury pair up nicely on the evenings of August 14-18, then are joined by the waxing crescent Moon in an interesting group on the evenings of August 21 and 22.

## Seeing Less Red

Astronomers have recently determined that Jupiter's Great Red Spot—an enormous hurricane in the Jovian atmosphere—is shrinking, and some suggest that it could disappear completely. This development is the latest in a string of events on the largest planet which has seen the appearance of smaller red spots during the past several years.

| | Sunrise | Local Noon | Sunset |
|---|---|---|---|
| June 1 | 5:49 am PDT | 1:08 pm PDT | 8:26 pm PDT |
| July 1 | 5:52 am PDT | 1:14 pm PDT | 8:36 pm PDT |
| August 1 | 6:13 am PDT | 1:16 pm PDT | 8:18 pm PDT |

*Times are for San Francisco, CA, and will vary slightly for other locations.*

**Happy 384th, Giovanni!**
Celebrate the birthday of Giovanni Domenico Cassini, born on June 8, 1625. Cassini was the first to observe four of Saturn's moons, discovered the dark gap in Saturn's rings now called the Cassini Division, and co-discovered the Great Red Spot in the atmosphere of Jupiter. NASA's Cassini spacecraft, orbiting Saturn since 2004, is named after him.

## Tranquility Plus 40

One of the events being celebrated during this, the International Year of Astronomy, is the 40th anniversary of the first human footsteps on the surface of the Moon. On July 20, 1969, NASA astronauts Neil Armstrong and Edwin Aldrin rode the Apollo 11 Lunar Module "Eagle" to the dusty plains of the Moon's Sea of Tranquility, where they spent 21½ hours on the Moon's surface, collecting nearly 50 pounds of rocks, performing various science experiments, and taking hundreds of photographs before blasting off and returning to Earth. They were followed by five other teams of American astronauts through December 1972, when Eugene Cernan, commander of Apollo 17, left the last human footprints in the lunar dust. The Academy's lunar sample, which will soon be on display, was collected during the mission of Apollo 17.

### What Happened to All the Sunspots?

Sunspots appear when the Sun's contorted magnetic field penetrates its visible surface. In the mid-1800s, German astronomer Heinrich Schwabe discovered that the number of sunspots observed fluctuates in an 11-year cycle, with the extremes termed "solar maximum" and "solar minimum." As of this writing, NASA reports that 2008 was the Sun's quietest minimum in nearly a century, with no sunspots visible for 266 days of the year.

## Skywatcher's Guide (June – August 2009)

June 7

**Full Moon** against the stars of Ophiuchus, the unofficial "thirteenth constellation of the Zodiac." June's full Moon was dubbed the "Windy Moon" by the Algonquin, the "Corn Moon" by the Laguna, and the "Hot Weather Moon" by the Ponca.

June 20

**Summer solstice** in the Northern Hemisphere at 10:45 pm PDT—for people north of the equator, this is the longest day of the year. The Sun rises and sets at its northernmost points on the horizon, reaching its highest point at midday. South of the equator, this is observed as the Winter solstice, or the shortest day of the year.

June 22

**New Moon.** Naked-eye sighting of the first visible crescent after new at sunset on the 23rd marks the start of the month Rajab in the Islamic calendar. With the Moon also at perigee (closest to Earth) only 15 hours later, expect higher tides.

June 26

Peak of the highly variable **June Boötid meteor shower**, which has surprised observers in some years with up to 50 meteors per hour, radiating from Boötes the Herdsman, after which the shower is named.

July 3

**Full Moon** occurs in the predawn sky against the stars of Sagittarius. This Moon was also named the "Thunder Moon" by the Algonquin, the "Killer Whale Moon" by the Haida, and the "Buffalo Breeding Moon" by the Osage.

A penumbral lunar eclipse occurs as the full Moon skims the diffuse outer edge of Earth's shadow. Although occurring when the Moon is visible from much of the U.S., it is essentially imperceptible because that portion of the shadow is so pale.

July 21

**New Moon.** Sighting of the first crescent Moon marks the start of the month Sha'ban in the Islamic calendar. For most of the world, this won't be visible until sunset on the 23rd.

A total eclipse of the Sun occurs as the Moon passes between Earth and the Sun, casting its shadow onto parts of India, Nepal, Bhutan, Bangladesh, Tibet, and China. Thought not visible in the U.S., observers at the right spot along the eclipse path will see the longest total solar eclipse of the century.

July 28

Peak of the **Delta Aquarid meteor shower**, a display of about 20 meteors per hour, typically better-observed from the southern hemisphere. The first quarter Moon sets at midnight, leaving the rest of the night fairly dark for viewing.

August 5

**Full Moon**, also dubbed the "Time of Freshness" by the Mohawk, the "Collect Food for Winter Moon," and the "Blackberry Patches Moon" by the Wisham.

The second penumbral lunar eclipse in two successive full Moons occurs. The Moon passes slightly deeper into Earth's shadow this time, but it remains in the very pale outer portion, so the darkening is barely perceptible. Centered over the west coast of Africa, only the end is within sight of the U.S. east coast.

August 12

Peak of the **Perseid meteor shower**, though spoiled this year by the light of a last quarter Moon. Typically 50 meteors per hour radiate from the stars of the constellation Perseus the Hero.

August 20

**New Moon.** Naked-eye sighting of the first thin crescent at sunset on the 21st marks the start of Ramadan, the month of fasting in the Islamic calendar.

# Q&A

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## Insiders Tell the Best Stories

Teaching new generations to protect the natural world is key to the Academy's mission. That's why it has long attracted the loyal support of such passionate environmental advocates as Amy Rao and Joe Sciortino of the 11th Hour Project, and Richard Goldman.

**Through the 11th Hour Project, Amy Rao and Joe Sciortino are raising awareness around climate change, global warming, and environmentally friendly habits. Their partnership with the Academy is a big part of that goal.**

Q: The 11th Hour Project is a networking organization dedicated to finding proactive ways to create a sustainable world. How and when was this project created?
**Amy:** In 2005, I was in the audience when Al Gore gave his now-famous presentation on global warming. I was so moved I contacted my friend, Wendy Schmidt, and six months later we hosted Gore at Stanford, addressing nearly 2,000 Silicon Valley executives, scientists, and influential environmentalists from around the country. That event was so successful, we decided to keep the dialogue going.

Q: Why does "11th Hour" choose to support the Academy?
**Joe:** The Academy has a long history of communicating complex scientific ideas to the public. We were looking for an authoritative voice on climate change, and we felt that the Academy would be one of the best "thought leaders" on this issue, with its green construction and message of sustainability. Academy programs will reach thousands of school kids with positive learning moments about climate change.

Q: The 11th Hour Project helped underwrite the Academy's exhibit on climate change, *Altered State: Climate Change in California*. What is your favorite feature of the exhibit?
**Amy:** There are two short videos, one that shows melting ice in polar regions and one showing rising global temperatures from 1900 to 2100. I enjoy observing Academy visitors as they watch the videos—they're so captivated, sometimes they stay and watch them again.
**Joe:** I love the interactive food exhibit, which shows the different carbon footprints of the food choices you make. Right next door is the Academy Café, where you can deliciously implement good choices by eating sustainable foods.

Q: What would you tell young people about their power to become environmental advocates and change the future of this planet?
**Amy:** Today's youth have an enormous degree of power by making simple changes in their daily lives. Just by eating less meat each week, we can make a tremendous difference. Never accept food or water packaged in plastic or Styrofoam. It's up to you to change your behaviors, and it's not hard to do.
**Joe:** And don't forget to ride your bike or take public transit to the Academy. Be part of the solution!

*To learn more about giving opportunities, call (415) 379-5410 or visit www.calacademy.org/give.*

**Richard N. Goldman, President**
**Richard and Rhoda Goldman Fund**
Richard Goldman knows how to make the most of generosity. The Richard and Rhoda Goldman Fund provides resources and leadership for creative, risk-taking philanthropy, while the Goldman Environmental Prize is the world's most significant award honoring "grassroots environmentalists."

**When and why did green issues first catch your attention?**
I grew up as a Boy Scout, and would often spend weekends hiking in the Bay Area hills and camping in the Sierra Nevada and Yosemite. This instilled in me a profound respect for nature, which later became a strong commitment to conservation and environmental protection.

**How does the Academy's mission partner with your own commitment to environmental activism?**
Our organizations spread awareness about the environment, both through grant-making to organizations that are engaged in critical advocacy and on-the-ground work, and through telling the stories of inspiring activism on the global stage. I think our missions are closely related.

**What would you say to young people about their power to improve the health of our planet?**
I have seen our Earth change dramatically over the past eight decades—I know that the course we have been following cannot be sustained. We need to stand up for the environment, be educated about the issues, and make the necessary changes to ensure a healthy planet for future generations.

**During special events and members-only hours at the Academy, you never know who or what you may run into.**

① On March 3, Executive Director Greg Farrington congratulated Jared Miller of Elk Grove, California, for being the new Academy's one millionth visitor.

② Academy staff members added personal messages to a sign thanking the one million visitors who have come through the Academy's doors so far, and all those who have yet to visit.

③ Trustees and event co-chairs Laura Lazarus and Randi Fisher chat with featured artist and environmentalist Maya Lin at the first annual Collectors' Society dinner.

④ Ambassador and Mrs. Lane, and Paul and Anne Ehrlich mingled with fellow Academy supporters at a Curator's Reception on March 30.

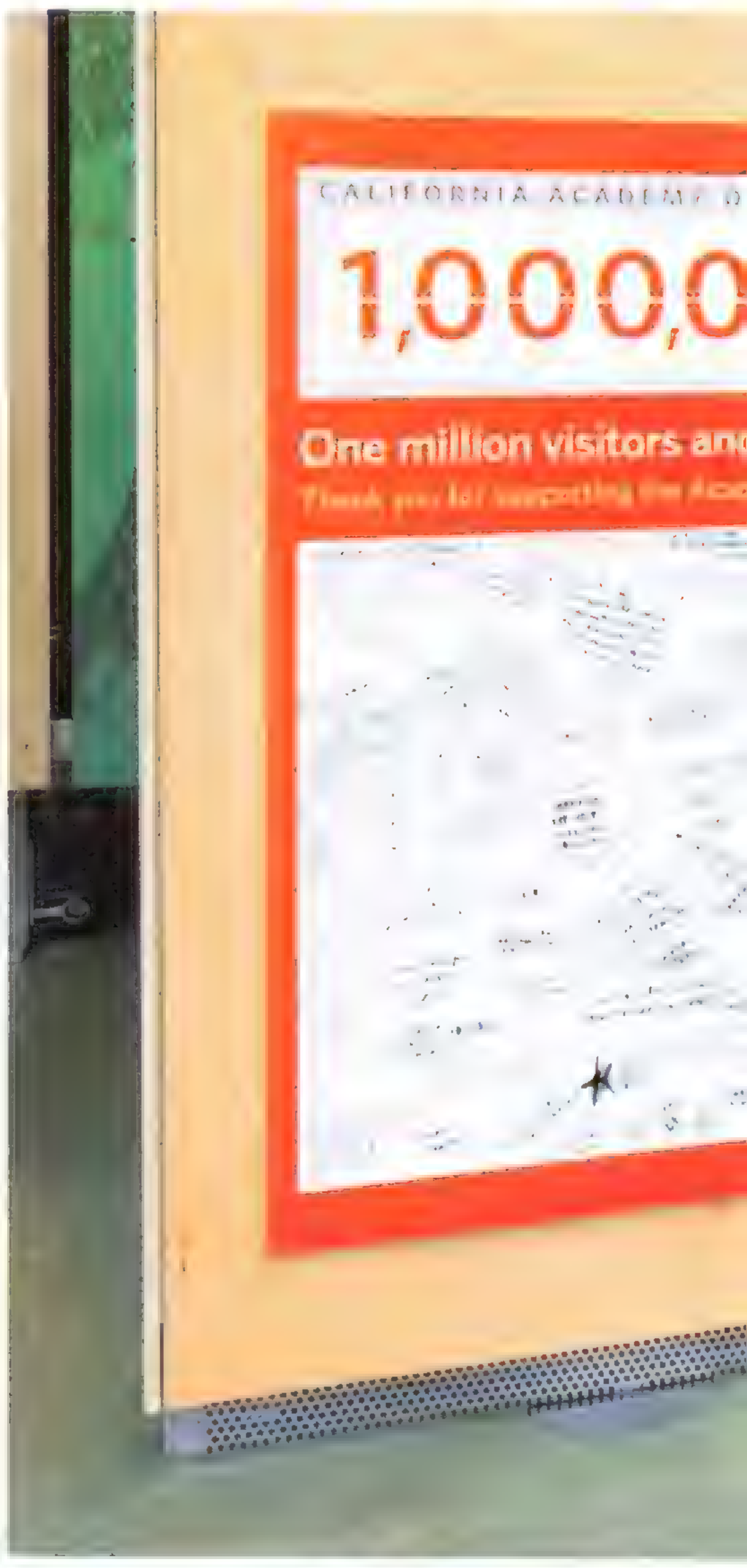
⑤ Guild families had a chance to learn about turtles and tortoises during the Guild Family Breakfast on March 29.

⑥ Academy Trustee and Eastwood Associate George G. Montgomery, Jr. with his wife, Nancy Montgomery, at the Collector's Society Dinner.

⑦ On February 12, the Academy celebrated Darwin's birthday and the launch of NightLife, a new weekly after-hours event.

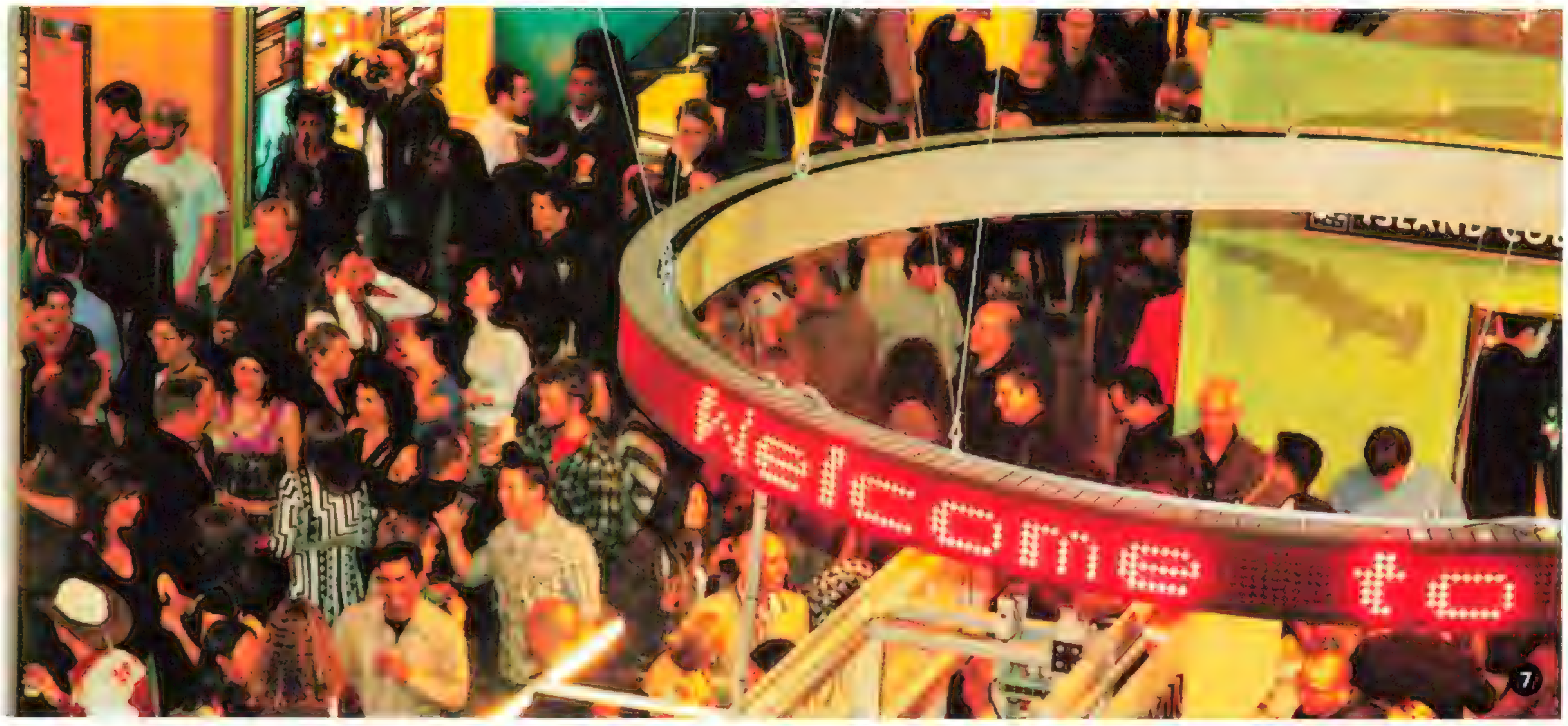
⑧ The Academy's new weekly NightLife events combine science and entertainment for an adult crowd every Thursday evening.

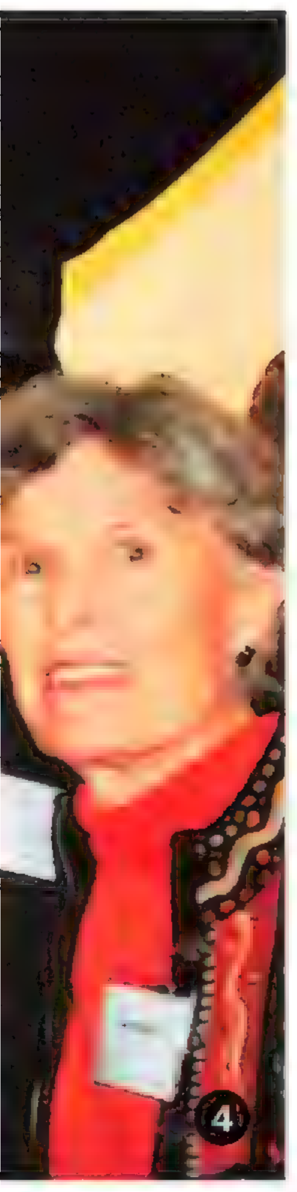
①



③

**Save the Date!**
The next Big Bang is on its way. **The 2009 Big Bang Gala** on Friday, September 25 will benefit education programs at the California Academy of Sciences.
For more information call (415) 379-5420.





**Get closer to science and the natural world, and be part of an exciting future by deepening your relationship with the Academy. Your increased support gives you added benefits and exclusive access to Academy happenings.**

**Become a Friend** and enjoy exciting new benefits, including exclusive Academy events and private behind-the-scenes experiences. Learn more at www.calacademy.org/join/friends.

**The greenest Guild welcomes members with children** who want to learn and experience more with their families, and get involved with science in fresh and exciting ways. Learn more at www.calacademy.org/join/guild.php.

**Some things do last forever.** For an enduring impact, join the Eastwood Associates and make the Academy part of your estate plan. Your legacy commitment to science, discovery, education, and a more sustainable world will shape the future. Learn more at www.calacademy.org/give/planned_giving.php.

# thank you!

Gifts received January 1 through March 31, 2009

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who recently increased their support ($750)

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who recently increased their support ($500)

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### New Eastwood Associates

A community of philanthropists whose planned gifts endow the Academy and sustain its important mission in the future

Robert and Mary Ann Christensen
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$50,000 and above
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$25,000 - $49,999
Save the Redwoods League
The Dean Witter Foundation

$10,000 - $24,999
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$1,000 - $9,999
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PG&E Pacific Gas and Electric Company®

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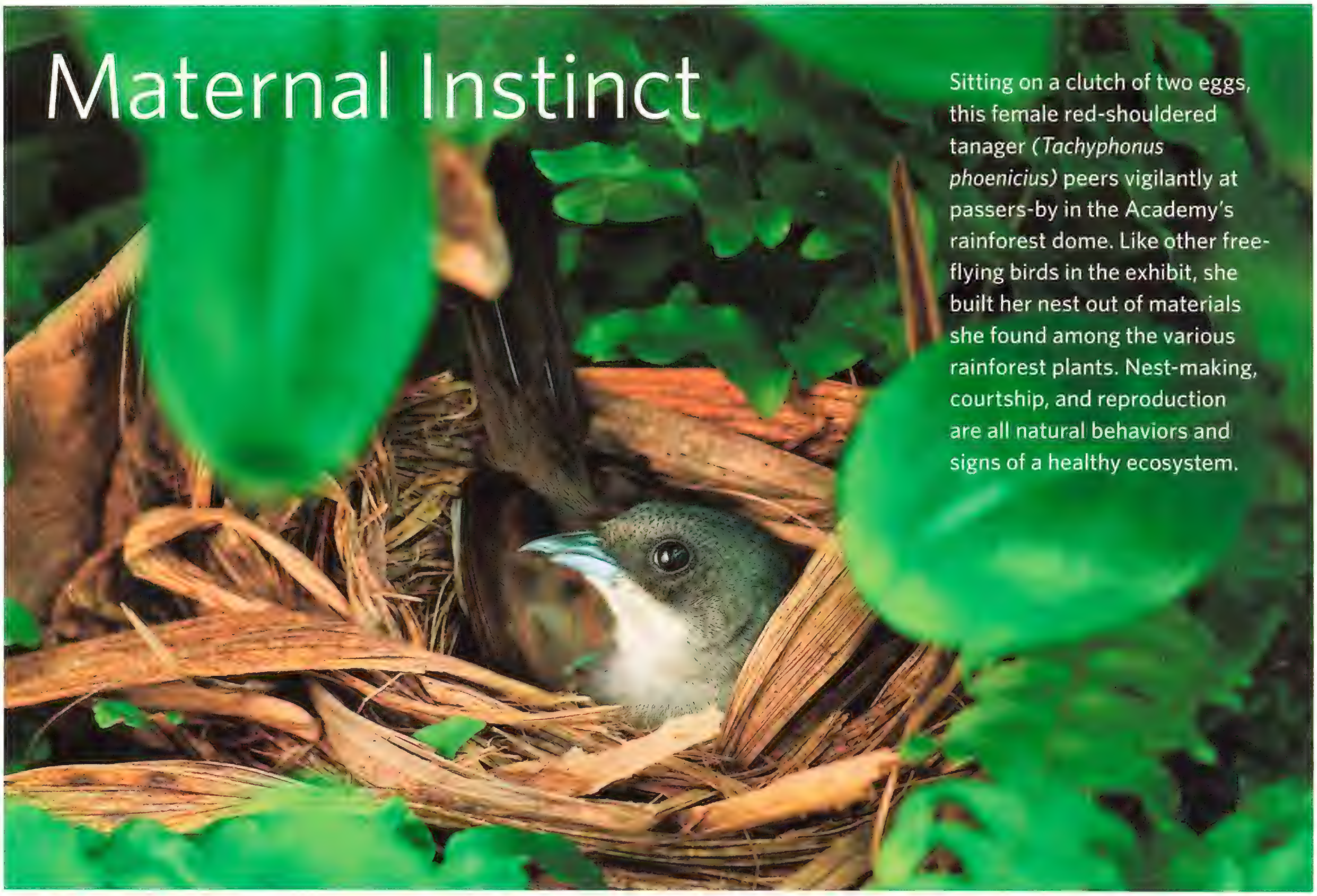
## Earth Day Grand Slam

### The Academy celebrated the first official Earth Day since its reopening with fun and flair.

On April 22, over 100 San Francisco school students participated in an **"Earth Day Conversation with Kids"** in the piazza. A panel of Academy scientists fielded the students' questions about climate change, conservation, and the environment.

That same day, the Academy teamed up with **PG&E and the Giants** to add an eco-friendly spin to the day's baseball game. Aquarium director and chief of public programs Dr. Chris Andrews (pictured here) threw out the first pitch with Balthazar, a red-tailed boa, coiled around his arm. Andrews threw the ball with so much gusto that it flew 10 feet over the catcher's mitt.

# Maternal Instinct



Sitting on a clutch of two eggs, this female red-shouldered tanager *(Tachyphonus phoenicius)* peers vigilantly at passers-by in the Academy's rainforest dome. Like other free-flying birds in the exhibit, she built her nest out of materials she found among the various rainforest plants. Nest-making, courtship, and reproduction are all natural behaviors and signs of a healthy ecosystem.

Photo: Sharon Beals

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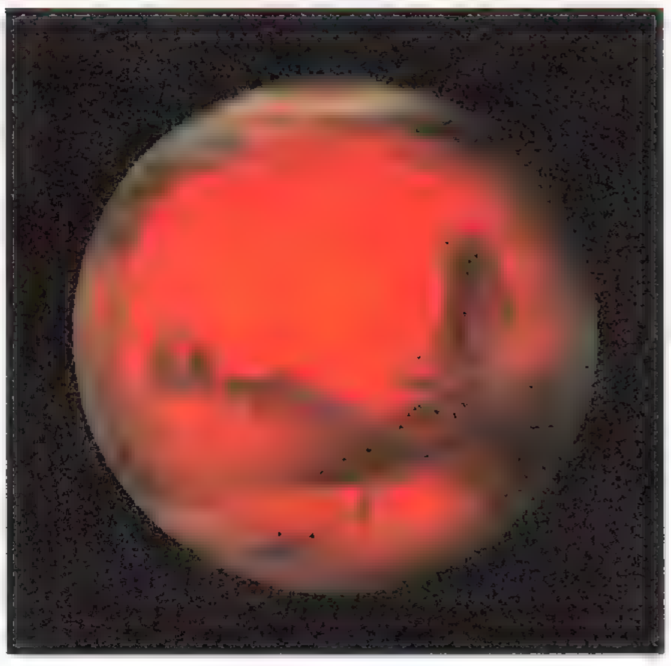
# Live at the Academy

June / July / August
2009

# June



### Monday, 6/1

DEAN LECTURE

**The New Mars: Habitability of a Neighbor World**

7:30 PM

David Des Marais of NASA Ames will discuss the past climate, latest discoveries, and possibility of life on Mars. See page 14 for details.

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### Tuesday, 6/2

**Explore Golden Gate Park with Naturalists**

9:30 AM – 12:30 PM

Join us for nature activities in Golden Gate Park and learn about the Academy's wild neighbors. See page 15 for details.

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### Saturday, 6/6

TEENS TALK BOOKS

**Underwater Explorations**

11 AM

This meeting of the teen book group will focus on *Shark Life* by Peter Benchley. See page 14 for details.

### Saturday, 6/6

AUTHOR TALK

**A is for Anaconda**

1:30 PM

Join artist Laura Regan for a talk and book signing of her rainforest alphabet book, *A is for Anaconda*. See page 14 for details.

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### Saturday–Sunday, 6/6–6/7

**World Oceans Day Festivities**

In honor of the first annual World Oceans Day, sample some of the Academy's water-themed programs this weekend. Check www.calacademy.org/events for details.

### Tuesday, 6/9

PRITZKER LECTURE

**Diagnosis: Mercury, Money, Politics, and Poison**

6:30 PM

Jane Hightower will share her experiences as the first doctor in the United States to correlate mercury poisoning with fish consumption. See page 14 for details.

## Green Tip

*"Encourage children to become environmentally conscious at an early age. Small actions over the course of a lifetime can make a big difference. For example, turn off the tap when brushing your teeth."*

***Dr. Peter Roopnarine***
*Curator of Invertebrate Zoology & Geology, California Academy of Sciences*

**Tuesday, 6/9**
Explore Golden Gate Park with Naturalists
1 – 4 PM
See page 15 for details.

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**Thursday, 6/11**
NightLife
Sustainable Seafood Celebration
6 – 10 PM
Join the San Francisco Seafood Watch Alliance at this special NightLife focusing on sustainable seafood. Enjoy cooking demos, lectures, and informal talks. Visit www.calacademy.org/nightlife for details.

---

**Tuesday, 6/16**
BOOKWORMS
Why Do Oceans Matter?
6:30 PM
This meeting of the adult book group will focus on *Sea Change: A Message of the Oceans* by Sylvia Earle. See page 14 for details.

---

**Wednesday, 6/17**
WACHOVIA WEDNESDAY
9:30 AM – 5 PM

The Academy is free to the public on the third Wednesday of each month. Large crowds are expected; members may wish to attend on a different day. Sponsored by Wachovia.

## Green Tip

*"When you're waiting for the water to warm up before your shower, put a bucket under the tap and collect the cold water. You can use this water in your garden."*

***Dr. Frank Almeda***
*Curator of Botany, California Academy of Sciences*

**Sunday, 6/28**
The Living Roof Project
9:30 AM – 12:30 PM
Become a citizen scientists and collect data for a long-term monitoring project on the Academy's living roof. See page 15 for details.

## More to See & Do

No two visits to the Academy are the same—check out the Discovery Tidepool, the Naturalist Center, and the programs below during your next visit to gain a new perspective on the natural world.

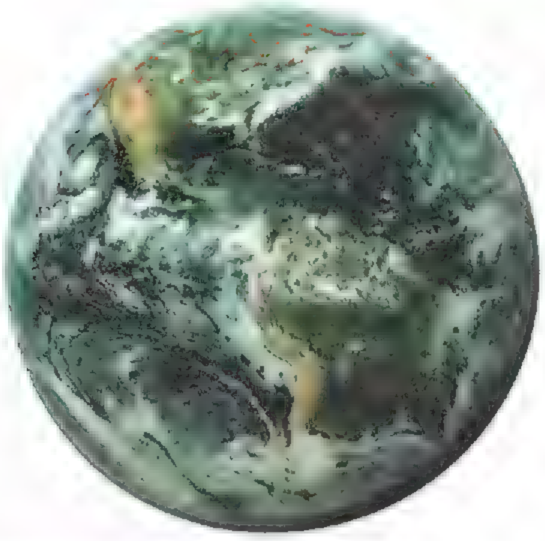
### Live Animal Demos

This summer, Academy naturalists will periodically bring live animals such as snakes, hissing cockroaches, and turtles out on the main floor for some up-close encounters. Locations and times vary from day to day—keep your eyes peeled during your visit and you may get a pleasant surprise!

### Cell Phone Audio Tours

Look for this logo at certain Academy exhibits indicating a cell phone audio tour stop. When you dial the posted number using your own cell phone, you will hear Academy staff sharing behind-the-scenes insights into the exhibit. This service is free except for minutes,

# July



**Monday, 7/6**

DEAN LECTURE

Habitable Worlds in the Universe

7:30 PM

Geoff Marcy of UC Berkeley will discuss the first searches for Earth-like worlds around other stars, using bizarre, extreme telescopes. See page 14 for details.

---

**Tuesday, 7/7**

Explore Golden Gate Park with Naturalists

1 – 4 PM

Join us for nature activities in Golden Gate Park and learn about the Academy's wild neighbors. See page 15 for details.

**Tuesday, 7/14**

Explore Golden Gate Park with Naturalists

9:30 AM – 12:30 PM

See page 15 for details.

# August

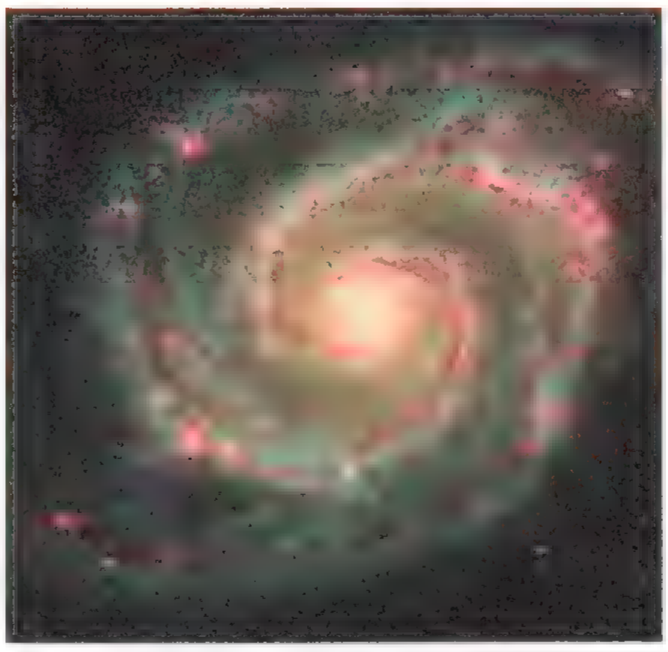
**Saturday, 8/1**

TEENS TALK BOOKS

The Carbon Challenge

11 AM

This meeting of the teen book group will focus on *The Carbon Diaries 2015* by Saci Lloyd. See page 14 for details.



**Monday, 8/3**

DEAN LECTURE

Astrobiology, Planetary Protection, and Hitch-hikers in the Solar System

7:30 PM

Margaret Race from SETI will provide a behind-the-scenes view of how experts from many different disciplines contribute to searches for extraterrestrial life. See page 14 for details.

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**Tuesday, 8/4**

Explore Golden Gate Park with Naturalists

9:30 AM – 12:30 PM

See page 15 for details.

## Specialty Tours: Go Behind the Scenes

Want to dive deeper into the Academy? The Platinum Tour is a two-and-a-half hour guided tour that will give you an exclusive look behind the scenes: explore the Aquarium Life Support System and secured collections, enjoy VIP seating in the planetarium and express access to the rainforest, and more. Or try the Deep Dive Tour, a one-hour guided tour that will take you

### Wednesday, 7/15

WACHOVIA WEDNESDAY

9:30 AM – 5 PM

The Academy is free to the public on the third Wednesday of each month. Large crowds are expected; members may wish to attend on a different day.

### Sunday, 7/19

The Living Roof Project

9:30 AM – 12:30 PM

See page 15 for details.

### Thursday, 7/23

The Living Roof Project

9:30 AM – 12:30 PM

Become a citizen scientists and collect data for a long-term monitoring project on the Academy's living roof. See page 15 for details.

### Sunday, 8/16

The Living Roof Project

9:30 AM – 12:30 PM

See page 15 for details

### Wednesday, 8/19

WACHOVIA WEDNESDAY

9:30 AM – 5 PM

Academy is free to public

### Thursday, 8/20

The Living Roof Project

9:30 AM – 12:30 PM

See page 15 for details.

### Tuesday, 8/25

Explore Golden Gate Park with Naturalists

1 – 4 PM

See page 15 for details.

behind the scenes either to the complex systems that support the aquarium or to the Academy's world-renowned research collections. You can also purchase these tours as gifts (member prices do not apply to gift tickets).

*Visit www.calacademy.org/tours for pricing and other information about Specialty Tours or to purchase tickets.*

according to your own cell phone plan.

### Early Explorers Cove

Take your scientist-in-training to a special exhibit designed especially for children five and under and their caregivers. Tots can explore a 15-foot replica of the Academy's 1905 research schooner, climb into a tree-house, tend a miniature organic garden, or crawl into a child-sized burrow. The exhibit is also well-stocked with books, toys, puzzles, and dress-up costumes. Explorers Cove Story Time takes place every Tuesday at 9:15 am (members only) and Saturday at 11:00 am.

Monday, Wednesday–Sunday: 10 AM – 5 PM

Tuesday: 8:30 AM – 5 PM

*Children may not be left unattended; space will be filled on a first-come, first-served basis.*

## Join the Online Community

### Do you use Facebook, Flickr, YouTube, or Twitter?

If so, consider joining the Academy's growing online community to share photos, videos, stories, and more. Visit **www.calacademy.org/academy/community** to get started.

EFFECTIVE JUNE 22

# **Every week** at the Academy!

## Monday

| | |
|---|---|
| 10 AM - 4 PM* | Bugs! |
| 10:30 AM - 4:30 PM** | Fragile Planet |
| 10:30 AM | Penguin Feeding |
| 11 AM | Swamp Talk |
| 11:30 AM | Coral Reef Dive |
| 12:30 PM | Penguin Show-n-tell |
| 1 PM | Swamp Talk |
| 1:30 PM | Penguin Show-n-tell |
| 2:30 PM | Coral Reef Dive |
| 3 PM | Swamp Talk |
| 3:30 PM | Penguin Feeding |

## Tuesday

| | |
|---|---|
| 9:30 AM / Members Only | Fragile Planet |
| 10 AM - 4 PM* | Bugs! |
| 10:30 AM - 4:30 PM** | Fragile Planet |
| 10:30 AM | Penguin Feeding |
| 11 AM | Swamp Talk |
| 11:30 AM | Coral Reef Dive |
| 12:30 PM | Penguin Show-n-tell |
| 1 PM | Swamp Talk |
| 1:30 PM | Penguin Show-n-tell |
| 1:30 PM | Lagoon Feeding |
| 2:30 PM | Coral Reef Dive |
| 3 PM | Swamp Talk |
| 3:30 PM | Penguin Feeding |

## Wednesday

| | |
|---|---|
| 10 AM - 4 PM* | Bugs! |
| 10:30 AM - 4:30 PM** | Fragile Planet |
| 10:30 AM | Penguin Feeding |
| 11 AM | Swamp Talk |
| 11:30 AM | Coral Reef Dive |
| 12:30 PM | Penguin Show-n-tell |
| 1 PM | Swamp Talk |
| 1:30 PM | Penguin Show-n-tell |
| 2:30 PM | Coral Reef Dive |
| 3 PM | Swamp Talk |
| 3:30 PM | Penguin Feeding |

## Thursday

| | |
|---|---|
| 10 AM - 4 PM* | Bugs! |
| 10:30 AM - 4:30 PM** | Fragile Planet |
| 10:30 AM | Penguin Feeding |
| 11 AM | Swamp Talk |
| 11:30 AM & 2:30 PM | Coral Reef Dive |
| 12:30 PM | Penguin Show-n-tell |
| 1 PM | Swamp Talk |
| 1:30 PM | Penguin Show-n-tell |
| 1:30 PM | Lagoon Feeding |
| 3 PM | Swamp Talk |
| 3:30 PM | Penguin Feeding |
| 6 - 10 PM | NightLife |

## Friday & Saturday

| | |
|---|---|
| 10 AM - 4 PM* | Bugs! |
| 10:30 AM - 4:30 PM** | Fragile Planet |
| 10:30 AM | Penguin Feeding |
| 11 AM | Swamp Talk |
| 11:30 AM | Coral Reef Dive |
| 12:30 PM | Penguin Show-n-tell |
| 1 PM | Swamp Talk |
| 1:30 PM | Penguin Show-n-tell |
| 2:30 PM | Coral Reef Dive |
| 3 PM | Swamp Talk |
| 3:30 PM | Penguin Feeding |

## Sunday

| | |
|---|---|
| 10:30 AM / Members Only | Fragile Planet |
| 10:30 AM / Members Only | Penguin Feeding |
| 11 AM / Members Only | Bugs! |
| 11 AM | Swamp Talk |
| 11:30 AM | Coral Reef Dive |
| 11:30 AM - 4:30 PM** | Fragile Planet |
| 12 noon - 4 PM* | Bugs! |
| 12:30 PM | Penguin Show-n-tell |
| 1 PM | Swamp Talk |
| 1:30 PM | Penguin Show-n-tell |
| 2:30 PM | Coral Reef Dive |
| 3 PM | Swamp Talk |
| 3:30 PM | Penguin Feeding |

## Featured Attractions

These regularly scheduled programs take place every week at the museum. Check the calendar section in this guide for information about additional special events.

### Coral Reef Dive

Location: Philippine Coral Reef (Lower Level)

Talk to a SCUBA diver as he swims among 2,000 colorful fish and introduces you to the world's deepest living coral reef display.

**Daily at 11:30 AM and 2:30 PM**

### Lagoon Feeding

Location: Reef Lagoon (L1)

Sharks and rays are among the most misunderstood animals on the planet. Meet an aquatic biologist who cares for these creatures and learn the fact behind the fiction.

**Tuesday / Thursday at 1:30 PM**

### Swamp Talk

Location: Swamp (L1)

Visit the Swamp to learn about some of the Academy's most popular animals. You'll find out what it takes to care for the alligators and turtles, which are native to swamps in the southeastern United States.

**Daily at 11 AM, 1 PM, 3 PM**

EFFECTIVE JUNE 22

### Penguin Feeding

Location: African Hall

Meet Pierre, Ocio, and the rest of the African penguin colony as an aquatic biologist feeds and cares for the birds while answering your questions.

**Daily: 10:30 AM and 3:30 PM**

### Penguin Show-n-tell

Location: African Hall

What makes a penguin a penguin? Families are invited to learn why the beaks, wings, and feathers of a penguin are so special. Discover the mystery word of the day!

**Daily: 12:30 and 1:30 PM**

EFFECTIVE JUNE 22

### Bugs!

Location: Hearst Forum 3D Theater

This 25-minute film is a remarkable foray into the insect life of Borneo. Using immersive 3D technology, *Bugs!* follows the life cycles of Hierodula, the praying mantis, and Papilio, the butterfly.

**Monday–Saturday: Every hour on the hour from 10 AM – 4 PM**

**Sunday: Every hour on the hour from 11 AM – 4 PM**

***Note: The 11 AM show on Sunday is offered exclusively for members.***

### Fragile Planet

Location: Morrison Planetarium

Leave Planet Earth behind as you fly to the farthest reaches of the Universe in this 30-minute show. Begin your voyage at the Academy, lift off through the atmosphere to gain an astronaut's view of Earth, then travel to the Moon, Mars, and beyond to search for habitats that might support life.

***Fragile Planet* will be shown 7-9 times a day, depending on the day. Please check with Guest Services upon arrival for the day's schedule and to pick up your passes.**

***Note: Seats are limited and on a first-come, first-served basis.***

### NightLife

Gaze into the stars, get up close and personal with aquarium critters, explore art with a scientific edge, and much more during the Academy's weekly NightLife events. Tickets cost $8 for members, $10 non-members. NightLife is for patrons ages 21 and over; a valid ID is required for entry.

**Every Thursday from 6 – 10 PM**

*Every hour on the hour

**Check with Guest Services upon arrival for the day's schedule

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